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MYOPIA THE RESULT OF CONSTITUTIONAL DISEASE.

By Rayner D. Batten, M.D., B.S., Lond.

Thirty years ago, Donders wrote: "The cure of myopia belongs to the *pia vota*. The more our knowledge of the basis of this anomaly has been established, the more certainly does any expectation in that direction appear to be destroyed, even with respect to the future." Now Donders was a great man, and we have very much for which to thank him. But when he wrote this, I believe he did a great injury to ophthalmic science and imposed a severe check on its development, from which it has not yet recovered. Since then, numbers of ophthalmic surgeons have written on the causation and treatment of myopia, and have copied and re-copied what he taught, continuing to state that myopia is incurable and unpreventable, and that our race is doomed to become more and more myopic as its civilization progresses. Such being the present state of our knowledge on the subject, I make no apology for bringing forward this paper, for it points to a cause of myopia, a constitutional cause, a cause capable of being treated; and insists that myopia should therefore be regarded as a preventable, if not a curable, disease.

In a former paper* I have expressed the opinion that both hypermetropia and myopia are very often asso-

* Some Points of Relationship of the Eye to the Cardio-Vascular System. A paper read before the Harveian Society.—Vide *Lancet*, May 2nd and 9th, 1891.

Ophthal. Review, Vol. XI. No. 123. January, 1892.

ciated with certain constitutional conditions, mainly showing themselves in the cardio-vascular system, and constituting what, for want of a more accurate term, I called a "myopic and hypermetropic circulation," and I described what I considered the differences between them, namely, differences in pulse and cardiac signs. I also claimed as evidence of constitutional difference between the myope and hypermetrope the comparative freedom of the former from optic neuritis—a difference which subsequent observations have tended to confirm.

Since reading that paper, I have been engaged in more closely studying the subject, especially with regard to myopia and its associated constitutional conditions.

I now propose to give some of my conclusions and some cases illustrative of them, and, in so doing, I shall invert the usual order, and give my theories first, so that my cases may be considered from my own point of view.

I wish to call attention to the frequent association of myopia with vascular disease. To what extent these two conditions are dependent on each other has yet to be determined—that is, whether there is one disease affecting both the vascular and ocular structures and causing changes in shape and condition in both; or whether the vascular disease so affects the nutrition and tension of the eye as to cause its dilatation.

Now the study of the causes of myopia has generally been the study of its secondary causes, while the primary causes have been neglected. Myopia has been compared to rickets, to which it holds a close resemblance, and the reasonable study of it should be based on the same plan. The mechanical causes of the various deformities produced in the bones in rickets are of great interest, and the rules which regulate the form the bones take are well understood. But the most thorough knowledge of all the deformities and the mechanical causes of their production can help us but little in its treatment. Even if we go a step further, and say the

cause of rickets is an undue yielding of the bones, owing to their softened condition, we are still no nearer the true cause, and therefore no nearer its true treatment, and, until its *constitutional* cause is understood, we can merely correct or alleviate its deformities by splints, etc.

Now just as in rickets the deformities called first for attention, so it has been in myopia. The eye has been given its splints and crutches, in the shape of correcting glasses, and this has been done so well that the wearers are rather proud of them, and consider them as a sign of higher intellect, and a necessary product of advanced education. As in rickets the mechanical causes have been thoroughly studied, so in myopia the mechanical cause of the shape the eye takes is very well understood; but the reason why the sclerotic should dilate, expand, and yield, is still unknown. In fact, we at present know nothing of the true causes of myopia; we only know some of its effects; and it would be just as reasonable to say that the causes of rickets are standing, walking, sitting, or any of the positions which result in the deformities, as to say that myopia is caused by extra use of the eyes, by the action of the ocular muscles, the height of the orbit, or any other of the many "causes" to which it is assigned.

A myopic eye has been held to be a *healthy* eye with too long an axis, and within certain limits this may be so. But the fact that an eye obtains good vision when aided by glasses is no proof that it has not been damaged by disease. Myopia may in this connection be compared with heart disease, specially with dilated heart, which, like myopia, may be caused by disease and strain, acting alone or together. These factors, either separately or conjointly, may be the cause of heart or eye dilatation, and to a certain point the dilatation may take place without any *disturbance of function*. But this does not alter the fact that it is a diseased condition. In my present paper, I do not claim to have found the primary cause of myopia, but

I think I shall have got one step nearer it if I can show that the change in the eye is not an isolated one, affecting the eye only, but is part of a general constitutional change.

The acute or rapid production of myopia is, I think, not sufficiently recognised.

If inquiry is made of patients as to when the "short-sightedness" began, they will often give a most definite history of the time of its onset or increase. Of course it is easy to deny this history, and insist upon the proof of good vision previously; but this method of proceeding is hardly fair. If a patient can give a history of onset of "short-sight" so comparatively sudden that he fixes it as having occurred in the course of a few weeks, he may, I think, be reasonably believed. The constitutional causation of the *increase* of myopia is recognised to a limited extent. Nettleship says, "Myopia seldom increases after the age of 25, unless under special circumstances. General enfeeblement of health, as after severe illness or prolonged suckling, seriously increases the risk of its progress, even after middle life." [Nettleship, "Diseases of the Eye," p. 280.] But it is only when the proof is so positive that there is no possibility of denying it, that the acute increase of myopia is allowed, and histories of the acute onset of myopia are seldom sought for, and rarely believed. In fact, the trouble and ingenuity that is usually taken to explain it by, or attribute it to, any cause except the most obvious is truly wonderful. But surely it does seem most reasonable that, if constitutional causes are recognised as an important factor in the *increase* of myopia, they should also be an important factor in its original causation.

Cases of acute myopia are, of course, comparatively rare. Myopia is generally a chronic condition, of slow onset, and slow progress; so slow that the patient only recognises its progress by the occasional necessity of changing his glasses. My argument is that if acute

constitutional disturbance can produce acute myopia, chronic constitutional disturbance may result in simple myopia; and it is the evidence of this constitutional condition that I shall endeavour to produce.

The condition is one that might reasonably be termed "vascular rickets," as it appears to depend on a yielding of the vascular and ocular walls. It may be defined as a disease chiefly of city life, the result of faulty nutrition, developing during the period of youth and growth, and producing deformities of the eye and cardio-vascular system. It frequently appears first at one of the nutritional changes of life, such as second dentition, puberty, commencement of menstruation, or the period just before full growth.

I offer as evidence of the vascular disturbance associated with myopia the following conditions:—

1. Spontaneous hæmorrhages (epistaxis; menorrhagia; retinal hæmorrhages).

2. Capillary congestion.

3. Cardio-vascular disease (high arterial tension; cardiac hypertrophy; valvular disease).

The tendency to hæmorrhage is recognised in myopia as a *local* condition; but what I wish to insist on is, that there is a *general* tendency to hæmorrhage, not limited to the eye, but occurring as spontaneous hæmorrhages in other parts of the body. These hæmorrhages in some instances precede the occurrence of myopia, and they are valuable symptoms of a faulty state of the vascular system. They are in themselves probably beneficial, affording relief to the vascular system, and the myopia would appear, in some cases, to come on when this relief ceases. In this connection the treatment of myopia by bleeding (heurtelouping) is interesting, as being apparently an unconscious imitation of nature's own method.

Of these spontaneous hæmorrhages, epistaxis I consider a common accompaniment of myopia, which it often appears to precede. In some cases it has been

a most marked symptom, seriously interfering with the patient's business.

Menorrhagia, often a recognised symptom of cardio-vascular disease, I consider one of the associated symptoms in myopia, sometimes taking the place of epistaxis in the male, and produced by much the same causes. The catamenia are either too frequent, too copious, or both. Delay in the establishment of the menstrual periods appears sometimes to cause rapid increase of myopia.

The tendency to retinal hæmorrhage in myopes is well known.

I consider as evidence of capillary congestion the full red lips and rather high-coloured cheeks frequently observable chiefly in young myopes. They are also very rarely anæmic.

Proceeding to the cardio-vascular condition of myopes, the pulse is readily felt. The pulse-rate, except in rapid progressive cases, is rather slow—that is, it is often slower than might be expected from the general appearance and behaviour of the patient, but it is within normal limits. It is a large, full pulse. The arterial walls feel thin. The tension is full, and often distinctly high. The pulse is recurrent, not only at the wrist, but also in other arteries, *e.g.*, the temporal.

The heart shows signs of enlargement of very variable degrees, and this is probably due to both dilatation and hypertrophy.

There is generally some alteration in the rhythm and accentuation of the sounds. An accentuation of the second aortic sound is perhaps the most frequent.

Well-marked valvular disease is also not infrequent.

Now the vascular disturbance I have described above is, I believe, nothing else than a form of high arterial (or pulse) tension, or the effects of it.

I am aware that I use the term high arterial tension in a wider sense than that generally accepted. Pulse tension like ocular tension, is, to a certain extent, a matter for each,

individual to decide what is normal or physiological, and what is pathological. No distinct line can be fixed between the two. The extremes are well marked, and no one can fail to recognise them. The recognition of slight increase in pulse tension is largely an individual matter; and in forming the diagnosis it is of importance not to be guided by the pulse alone, but to take into consideration the condition of the heart, and other symptoms.

I do not wish to lead any one to suppose that, in the majority of cases of myopia the changes in the pulse, etc., are anything very obvious, or that they can be made out in every case. But I believe that any one who will take the trouble to observe a few cases thoroughly will very soon be convinced of their existence.

There are many admirable descriptions of the condition of high pulse tension as it occurs in adults, but I know of none as it occurs in the young; yet I believe it to be a condition by no means rare. But as it gives rise to a different class of symptoms in the young and the adult, it has not been recognised as the same condition. The difference in the characters of the pulse is, I think, explained by the different ages at which the increased tension occurs. Thus in renal cases, or cases of high pulse tension occurring in late life, we have an increased pressure in vessels which have already lost much of their elasticity, and have become firm, fixed, and undilatable. But high pulse tension occurring in a young subject, when the vascular walls are soft and elastic, must produce results far different. The arteries, however great the pressure, still have a reserve of elasticity, and hence can never become hard, as in the renal pulse. Again, in the young, a constant or frequent strain on the arterial walls will gradually cause them to yield and become stretched, and hence the large thin-walled arteries of the myope, due to the stretched fibrous coat.

I consider the recurrent pulse is another result of long-continued high arterial tension, and it is but

reasonable to expect that continued high arterial tension should not only cause the larger arteries to dilate, but also the smaller ones, thus giving rise to a more free anastamosis between the vessels. This free anastamosis is probably to a large degree compensatory. The possessor of a habitual high pulse tension becomes accustomed to it and tolerates it, whereas a subject of low tension acquiring high tension later in life, when the arterial wall has become thickened and fixed, suffers from its constitutional effects. Myopes seldom develop high arterial tension in its typical form as met with in renal disease.

That the capillaries are not generally dilated is evidenced by the existence of high arterial tension. But I think that it may be the dilatation of the capillaries in acute progressive myopia which causes the marked difference in pulse in those cases from the pulse in ordinary myopia, the pulse in the former being rapid, soft, and compressible.

Now it is, I think, in no way an unreasonable theory that a chronic vascular disorder should give rise to myopia, *i.e.*, to an enlargement of the eye-ball.

In fact, an increase of blood-pressure as a cause of myopia has been recognised, taught, and accepted by most writers on the subject, myopia having generally been attributed to a softening due to congestion caused by prolonged stooping, pressure on the chest, etc. All this I freely admit. But while the local and temporary increase of blood-pressure has been recognised and treated, the general constitutional increase has been left unrecognised and untreated ; and I believe that it is this constitutional high pulse tension which alone causes the local increase of pressure to be injurious. It is the *constant* high pulse tension which does the harm, and interferes with the nutrition. The vascular system is very well adapted to withstand occasional increase of blood-pressure ; but it is with the blood-vessels and eye,

as with other structures, that *constant* pressure causes atrophy and thinning.

If the vascular supply to the upper limbs be interfered with, whether by heart disease, aneurism, or phthisis, the finger-tips are apt to become clubbed. The eye is also an extremity, in that it has a terminal circulation, and if the general circulation is affected, it is perfectly reasonable to expect that the nutrition of the eye will be affected, and that over-growth may take place.

A great deal has been written on the prevention of myopia in school children by school hygiene, of which the principal factors are

(1) The prevention of stooping;

(2) The avoidance of eye-strain by good light and good print.

Very much has been done in this way, but its result on the prevention of the increase of myopia has been very disappointing, for the evidence goes to show that the myopia continues to increase in spite of it, and that, as the higher classes are reached, so a larger percentage of myopes is found.

Now my contention is, that the myopia continues to progress because its causes are not recognised, and therefore not removed.

I hold, then, that myopia is generally evidence of a constitutional disease, either past or existing. Of a past disease it may be the only remaining evidence, the other effects having been recovered from, just as some alteration in the shape of the bones may be the only remaining evidence of rickets.

The cause of the myopia may have been active for a few years only, during which time its effects have been evident on other structures besides the eye; but the cause passing away, they have recovered, whereas the fibrous sclerotic, once damaged and stretched, does not recover. The eye, when once myopic, apparently remains so. This, I think, is the reason why, in some

myopes, the pulse and heart signs are indistinguishable from the normal; the cardio-vascular system may have completely recovered, its walls being muscular, and therefore able to recover, if the stretching does not persist, and has not been of too long duration. In most myopes, however, I think I can detect evidences of past damage on the cardio-vascular system. The constitutional symtoms I have described as being associated with myopia, I do not consider as being by any means limited to it. And from my observations of the constitutional state in eye-patients I have been led to include with the myopes, cases of high astigmatism, whether myopic or hypermetropic; some cases of hypermetropia with bad vision, and cases of lamellar cataract.

My attention having thus been directed to the subject of astigmatism, I have been endeavouring to find out the views of authors on the subject of its production and cause. Whether it is liable to increase, and if so in what direction? Is it congenital, or acquired? And are young children astigmatic any more than they are myopic?

But in English text-books I can find no mention oi the subject. Some of the American observers seem, however, to have taken up the subject, and to regard astigmatism as allied to myopia, in that they recognise its tendency to change. Dr. S. D. Risley speaks of "eyes passing while under observation from hypermetropic to myopic refraction by the turnstile of astigmatism." He also notes retino-choroidal changes in these cases, but considers that the astigmatism is the cause of the eye-ball distension. (Oph. Review, vol. vi. p. 276).

Astigmatism is, of course, elaborately classified for the optician's benefit; but from a medical or surgical point of view, it is absolutely unclassified.

With regard to astigmatics, I regret that I have not so closely observed their constitutional condition as I

have in the uncomplicated cases of hypermetropia and myopia; that is to say, I have not made notes of them, so that I can only speak from my general impressions. But, speaking thus, I would say that all astigmatics of high degree, whether hypermetropic or myopic, should be classified constitutionally with the myopes, as cases of *yielding eyes*—eyes which have yielded from a constitutional cause; and the mere fact of their requiring a convex or concave lens should not determine the class to which they are to be assigned.

Cases of hypermetropia with bad vision and of lamellar cataract are probably both due to constitutional causes, which may account for their similarity to cases of myopia. On the other hand, some myopes are constitutionally indistinguishable from emmetropes. Some of these are —as I have explained—due simply to the constitution having entirely recovered from its injury, while the eye is left defective. But there are others to which I do not think this explanation will apply.

I have endeavoured to show that what I consider to be a common cause of myopia is high pulse tension, or, rather, that a common cause can give rise to vascular and eye changes. I would, therefore, ask you to consider how far my theory is borne out by the conditions under which we find myopia occurring. I think it is generally accepted that myopia is commoner amongst the sedentary, the well-to-do, and Germans. It is also generally accepted that high arterial tension, when not due to actual disease, is often produced by a full meat diet, rich living, and deficient exercise. Add to this taking of beer or very little fluid, and you have the most favourable conditions for producing high arterial tension, which is caused by the contraction of the small arterioles, due to the presence in the blood of uric acid and other waste products in excess. This excess is due partly to excess of formation, partly to a gradual accumulation arising from a deficiency in

excretion of renal, biliary, intestinal, and cutaneous products.

Now all these conditions we have in the modern city school child, well-fed (or over-fed, for the amount of exercise taken), with hurried meals and insufficient time for digestion, followed by a hurried walk, and with deficient excretion arising from deficient exercise. In the German we find very similar conditions, and a variation of the same applies to the young ladies of the upper classes, who also put an extra strain on their nutrition and hearts by tight-lacing.

This, then, I offer as an explanation of one of the causes of myopia. Granted a faulty nutrition, affecting ocular and vascular structures, and an increased arterial and therefore ocular tension, the mechanical causes usually given amply account for the direction in which the eye yields.

Certain diseases are specially prone to cause the onset or progress of myopia; and while they are not diseases usually classified together, they have certain points in common: they all profoundly affect the general nutrition, and most, if not all, the vascular system.

In rheumatism, which I do not mean to limit to rheumatic fever, we certainly have a vascular disease and a nutritional disease, notably affecting fibrous tissues, and hence probably the yielding of the fibrous sclerotic.

That primary syphilis should be followed by myopia is, perhaps, only what might be expected, when it affects the eye itself, producing retino-choroidal and vitreous changes, and it is only in these cases that I have obtained evidence of it. Its tendency to cause vascular and nutritional disease is well known.

Mr. Phillips has noticed a connection also between myopia and inherited syphilis.

In one or two young alcoholic subjects (pot-boys) I have also found high myopia.

Some of my cases point to typhoid fever as the cause of the myopia. It certainly affects nutrition, though, as

regards its action on the vascular system, I cannot speak definitely.

In two cases of acute myopia, I have found phthisis associated. This may be only accidental, and I certainly do not consider the myope as a typically phthisical subject.

In pregnancy, an accepted cause of increase of myopia, we undoubtedly have a nutritional disturbance of the most general kind, and almost every structure is liable to change, and in addition we have a vascular change, namely, high arterial tension. So far, however, I have not met with any case of myopia with pregnancy as its primary cause.

I think I shall be stating the result of general experience when I say that choroiditis is commonly associated with myopia—that is, taking all forms of choroiditis, in the majority of cases the refraction is myopic; often only slightly so; but still, generally myopic.

I have already stated that I consider primary syphilis, when accompanied with eye-symptoms, as being sometimes a cause of myopia; and when the disease takes the form of choroiditis, I consider it equally a cause of the myopia which follows.

Choroiditis is, in most cases, accepted as evidence of constitutional disease, whether that disease be syphilis, congenital or acquired; rheumatism; gout; defects of menstruation; or tuberculosis. " Choroidal changes, like those of the retina, are for the most part the result of special diseases." (Gower's Med. Opthal., p. 119.)

"Inflammatory and degenerative changes often occur, some of them entirely local, as in myopia; others symptomatic of constitutional or of generalised disease, such as syphilis and tuberculosis." (Nettleship, " Diseases of the Eye," ch. xii. p. 178.)

And yet this generally admitted symptom of constitutional disease, when it occurs in conjunction with myopia, is said to be "entirely local," and it is only when it occurs in a more than usually violent form, as

in some cases of acute progressive myopia, that it is admitted to have a constitutional cause, and is allowed a name—posterior sclero-choroiditis.

The divisions between the various kinds of myopia are purely artificial, and only matters of degree. There is, of course, a vast difference between the extremes of myopia; but there is no hard and fast line to be drawn between the various kinds. Therefore it is reasonable to look for a common cause for all kinds of myopia, and if disease and constitutional disturbance are found as a cause in high myopia, it is not unreasonable that a departure from health, whether sufficient to be termed a "disease" or not, be sought for in the lesser degrees of myopia.

Choroiditis may, in some cases, progress independently of thei ncrease in myopia. Donders says: "The atrophic crescent is not absent in higher degrees of myopia, and when in moderate degrees the atrophy may be in youth still wanting, it is developed, *even without increase of the myopia*, at a more advanced time of life." (Donders' "Accommodation and Refraction of the Eye," p. 448.)

The occasional occurrence of crescents in hypermetropes, and in cases of lamellar cataract without myopia would seem to indicate that the myopic crescent is a form of choroiditis, and not the result of the myopia.

Why, when in addition to choroiditis and vitreous opacitics there is dilatation of the eye, it should be held that the dilatation is the cause of the other two, it would be hard to say, especially as the dilatation is equally likely to be the result of the faulty nutrition, which has produced both the choroiditis and vitreous opacities.

Admittedly, choroiditis may progress a long way before it gives rise to any ophthalmoscopic signs. "Congestion of the choroid is not commonly recognisable by the ophthalmoscope. That active congestion does occur is certain; and it would seem that myopic eyes are especially liable to it." (Nettleship, "Diseases of the Eye," ch. xii.)

Some amount of choroidal disturbance is discoverable

in almost all myopic eyes; and I contend that it is a more warrantable assumption that myopia is caused by choroiditis, than that choroiditis is caused by myopia; I believe that the cause of both will be found in the cardio-vascular changes which I have endeavoured to describe.

In conclusion, then, I claim that there is sufficient evidence for considering myopia to be the result of constitutional disease; first, on what I consider the reasonable deductions from the generally accepted teaching of the cause and increase of myopia; secondly, on my own observations on the constitutional condition of myopic patients. The generally accepted teaching and my own observations may be briefly compared as follows:—

1. Myopia a local inherited tendency.	1. Myopia an inherited tendency, associated with inherited constitutional disease.
2. Increase of myopia caused by local vascular congestion and local increase of blood-pressure.	2. Commencement and increase of myopia caused by general and local vascular congestion and general and local increase of blood-pressure.
3. Increase of myopia caused by some constitutional diseases.	3. Commencement and increase of myopia caused by some constitutional diseases.
4. Myopia, accompanied by a tendency to local hæmorrhages (retinal).	4. Myopia, accompanied by a general tendency to hæmorrhage (epistaxis, menorrhagia, &c).
5. Myopia, a product of artificial and civilised life.	5. Cardio-vascular disease, also a product of artificial and civilised life.
6. The myopic eye shows evidence of degeneration in its tendency to change, its increase in size, and its liability to choroiditis, vitreous opacities, and detachment of retina.	6. The cardio-vascular system shows evidence of degeneration in high pulse tension, vascular dilatation, tortuous arteries, and heart disease.

In giving the following cases, I do not wish it to be supposed that I have based my theories on them alone.

For some time past, I have made a practice of making a more or less thorough physical examination of all refraction cases coming under my observation. Of some of these I have the notes, and the cases that I give are taken from among them.

My sincere thanks are due to Mr. Couper and Mr. Lawford for kindly affording me the opportunity of carrying on my observations. Also to Mr. Gunn for his permission to refer to one of his cases.

Case I.

Onset of myopia at 36 years of age, following rheumatic fever, preceded by habitual epistaxis and menorrhagia; cardio-vascular disease; progressive myopia.

July 4, 1891.—M. J. W. (female), age 43.

Previous History.—Healthy, except for severe epistaxis, with which she had been troubled until fifteen years ago. It was so severe that she always had to be prepared for it at night, when it would wake her up almost choked. Rheumatic fever nine years ago; ill for two or three months. About seven years ago, sudden severe pains in left eye; sight not affected at the time; sight gradually got misty. Four years ago, attended at Westminster Ophthalmic Hospital, when she was ordered 2D. sph. Catamenia very painful; copious; every three weeks. Have ceased now; ceased suddenly.

Family History.—F. slight rheumatism. One sister short-sighted.

Physical Examination.—Arteries full and tortuous; no recurrence.

Heart, apex displaced outwards in the nipple line. Impulse forcible; heaving.

$$V. \begin{array}{l} R.— 5.50 = \frac{6}{12} \\ L.— 11.0 = \frac{6}{9} \end{array}$$

Case II.

Myopia; rheumatism; rheumatic fever.

Sept., 1891.—B. S. B., age 33. Builders' foreman. Comes complaining of pains and stiffness of limbs.

Previous History.—Chorea as a boy; got quite well.

18 months ago rheumatism 5–6 weeks.
13 „ „ pleurisy and rheumatic fever.
3–4 „ „ influenza.
3 weeks „ quinzy throat.

Physical Examination.—Pulse 80. Arteries large, pulse tension raised, but not very high. The examination of the chest did not reveal anything except an accentuated second sound.

The pulse, however, was what I should have described as a "myopic pulse," and, on examination, I found that he had high myopic astigmatism.

V. R. $<\frac{6}{60}$ Ophthalmoscopic Estimation—10 and —14.
V. L. $<\frac{6}{60}$ —4 and — 9.

He had never worn glasses.

In this case the rheumatic tendency appears strongly; for not only is there history of rheumatic fever, but the rheumatic tendency is to be noticed in the chorea, tonsilitis, and rheumatic attacks.

CASE III.

Myopia; rheumatism; epistaxis; cardio-vascular changes.

I. V. (male), age 17, clerk, has noticed short sight about two years. Has had "rheumatics," keeping him in bed several times. Last attack three years ago. First attack nine years ago, when ioints were swollen. Is subject to epistaxis, though not so much as formerly.

Pulse 80, soft and recurrent.

Heart, apex 4 and 5 interspace, about in nipple line.

Impulse forcible, slightly heaving.

Accentuated 2nd sound to right of sternum.

Loud 1st sound. No murmur (?).

V. R. $<\frac{6}{60} - 3{\cdot}50 = \frac{6}{6}$.
V. L. $<\frac{6}{60} - 3.50 = \frac{6}{6}$.

Ophthalmoscopic Examination.—Rather unhealthy fundus, disturbance of pigment, halo round macula.

Note.—Mr. William Bull published three cases of myopia associated with rheumatic fever in the *Hospital Gazette* (Nov. 22nd, 1890), under the title, "What is the connection between mitral stenosis and myopia?"

CASE IV.

Acute myopia; cardio-vascular symptoms; menorrhagia.

Sept., 1891.—E. E., age 21, dressmaker.

History.—In March, 1891, noticed that she was rapidly getting short-sighted. One month ago, "could not use her eyes"; one week ago, gave up using them entirely.

Family History.—Two brothers, short sight; no rheumatism.

General Symptoms.—"Weak on the chest," shortness of breath on exercise; menstruation regular, very excessive, weak and faint at the periods, not much pain.

Physical Examination.—Pulse, 100 to 90. High pulse tension. Full tense arteries.

R. —4 cyl.
L. —4 cyl. —3 sph.

CASE V.

Acute onset of myopia; epistaxis.

July 11, 1891.—A. W., age 20, sailor.

Previous History.—Had very good sight as a schoolboy, 13 years old. His eyes were examined at school by a professional examiner, and given a first-class certificate. One and a-half years ago, while at sea, became short-sighted in the course of a few months. Spontaneous nose-bleeding three or four months ago. Has grown three inches in two years.

No family history of myopia.

Note.—This case is of interest partly on account of the definite history of the acute onset of myopia. The fact of its occurring at sea is interesting, as the conditions of life on board ship are exactly those liable to produce myopia, by causing high pulse tension.

I have come across other myopic sailors, though in the case of sailors the element of stooping and looking at near things is conspicuous by its absence.

CASE VI.

Myopia; cardio vascular symptoms.

June 9, 1891.—A. W. (female), age 17.

Is attending at Queen Square Hospital under Dr. Tooth, who sent her to Moorfields.

A rather tall, thin girl—*i.e.*, body and limbs thin; cheeks fat; lips red; weak, delicate-looking.

Physical Examination.—Pulse 128, small, and extinguished only with considerable pressure; a recurrent pulse, both at wrist and temporal artery, which is rather tortuous. Heart, apex diffused; impulse felt in fourth, fifth and sixth interspaces, in and outside nipple line; excited action; no distinct murmur; first sound not quite clear at apex.

Family History.—Father died of consumption.

$$\text{V.}\quad \begin{array}{l} \text{R. } \frac{2}{60}\ \dfrac{-1{\cdot}50 \text{ cyl. horiz.}}{-8 \text{ sph.}} = \frac{6}{12} \\[2ex] \text{L. } \frac{2}{60}\ \dfrac{-1{\cdot}50 \text{ cyl. horiz.}}{-6{\cdot}50 \text{ sph.}} = \frac{6}{18} \end{array}$$

Nov. 10, 1891.—Pulse 140; temporal arteries markedly tortuous; fundus examined; the vessels on leaving the optic discs turned towards the nasal side of fundus.

CASE VII.

Myopia and epistaxis.

Oct. 3, 1891.—E. T., age 16, turner.

Near-sighted all his life. Brothers and sisters also short-sighted. Always subject to nose bleeding, so much so that his nose bleeds every time he washes his face, and interferes with his work. Pulse 60, no high pulse tension; heart sounds normal, no impulse felt; hands rather blue and cold.

$$\text{V.}\quad \begin{array}{l} \text{R. } \frac{6}{60}\ \dfrac{-3 \text{ sph.}}{-1 \text{ cyl.}} = \frac{6}{6} \\[2ex] \text{L. } \frac{6}{60}\ \dfrac{-3{\cdot}5 \text{ sph.}}{-1 \text{ cyl.}} = \frac{6}{6} \end{array}$$

CASE VIII.

Myopia and epistaxis.

E. S. (female), age 14.

She was a very large child at birth; has always been healthy, except that she has always been liable to epistaxis since a baby; first menstruated six months ago; "short-sight" first noticed when 11 years old; refraction highly myopic.

CASE IX.

High myopia; epistaxis; hæmorrhage in macula region.

1891.—E. R., age 27, engineer.

History.—General health fairly good; suffered from nose-bleeding very much between 16 and 20 years of age, not since; no rheumatism.

Family History.—Father and mother "not short-sighted." One brother and one sister, about the same as himself.

Physical Examination.—Thin, poorly-covered chest; heart

sounds regular, no murmur; pulse 84, fairly full, normal; high myopia right and left, about — 18 D; sight failing in right eye; hæmorrhage in macular region.

Case X.

Myopia and cardiac symptoms.

I. S. (male), age 13.

Heart examined. Apex beat outside nipple line, heaving impulse; first sound accentuated, and much louder than second sound, even in aortic area.

$$\text{V.}\quad \begin{array}{l} \text{R.}\ \dfrac{-2\ \text{D. sph.}}{-3\ \text{D. cyl.}} = \frac{6}{18} \\ \text{L.}\ \dfrac{-5\ \text{sph.}}{-2{\cdot}5\ \text{cyl.}} = \frac{6}{18} \end{array}$$

Case XI.

Acute myopia preceded by epistaxis; phthisis; unusual form of myopia.

Oct. 17, 1891.—S. T. (female), age 24, box-maker.

History.—Six months ago, her sight failed suddenly—*i.e.*, in the course of a week or two—so that she was unable to see "to cross the road without screwing up her eyes"; previously she had seen well. Up to 12 months ago, suffered frequently from nose-bleeding, occurring two or three times a week; this had lasted for some years (two or three) previously.

Physical Examination.—Heart, nothing distinctive; pulse full, soft, recurrent; phthisis well marked (left apex).

$$\text{V.}\quad \begin{array}{ll} \text{R.}\ \frac{6}{60} & \text{Under} \\ & \text{Atropine} \\ \text{L.}\ \frac{6}{24} & \text{Oct. 21.} \end{array} \left\} \begin{array}{l} < \frac{6}{60}\ -3\ \text{sph.} = \frac{6}{12} \\ \\ < \frac{6}{60}\ -4\ \text{sph.} = \frac{6}{[illegible]} \end{array} \right.$$

Oct. 21. *Ophthalmoscopic Examination.*—There is a marked difference in refraction between the macula and disc.

Mac.	R. —3 D.	L. —3 D.
Disc.	—8 D.	—7 D.

The O.D.'s appear tilted towards the nasal side, and the vessels turn in that direction.

Case XII.

High myopia; "weakness of chest."

Oct. 14, 1891.—L. Y. (female), age 23.

Much troubled with chronic cough and shortness of breath.

Chest Examination.—Heart, apex fourth interspace just inside nipple line; slight thrill at apex; no lung mischief.

High myopia.

$$\begin{array}{l} \text{R. } -16 \text{ sph.} = \frac{6}{60} \\ \text{L. } -16 \text{ sph.} = \frac{6}{36} \end{array}$$

Case XIII.

Myopia; cardio-vascular symptoms; epistaxis.

J. C. (male), age 25.

Always "short-sighted," occasional nose-bleeding.

Chest Examination.—Heart, apex beat fourth and fifth interspaces in nipple line; heaving impulse; heart-sounds of a booming character; pulse 124.

One sister said to be "short-sighted."

$$\begin{array}{l} \text{R. } \dfrac{-2 \text{ cyl.}}{-5 \text{ sph.}} = \frac{6}{9} \\[2ex] \text{L. } \dfrac{-3 \text{ cyl.}}{-4 \text{ sph.}} = \frac{6}{9} \end{array}$$

Ophthalmoscopic Examination.—Retinal vessels turned towards nasal side of fundus.

Case XIV.

Myopia and heart disease.

M. P., nurse, age 36; looks very much older.

Complains of "short sight"; has always had it, and the glasses last ordered do not suit; general health has never been good. In 1884 she had "rheumatic or typhoid fever"—the diagnosis was uncertain; subsequently she had "nephritis."

Physical Examination.—Temporal arteries prominent and tortuous; heart's impulse heaving and diffuse, outside nipple line; loud systolic murmur heard all over cardiac area, especially at apex.

$$\text{V.} \begin{array}{l} \text{R. } \frac{6}{60} \; \dfrac{-7 \text{ sph.}}{-4 \text{ cyl.}} = \frac{6}{12} \\[2ex] \text{L. } \frac{6}{60} \; \dfrac{-3 \text{ sph.}}{-\cdot 75 \text{ cyl.}} = \frac{6}{24} \end{array}$$

Note.—In some cases, the occurrence of myopia may precede the definite signs of constitutional disease; but I do not consider that his is in any way opposed to the theory that myopia is of constitutional origin, for my contention is not so much that the cardio-

vascular disease produces the myopia as that both cardio-vascular and myopic symptoms are the result of a common cause. Hence I consider it of equal importance to carefully note the diseases which follow myopia as those which precede it.

Case XV.

High myopia and heart disease in a child.

E. F., age 8.

Family History.—Father "short-sighted" and "rheumatic."

Physical Examination.—Pulse 80, soft recurrent; heart, apex displaced outside nipple line; impulse heaving; loud musical murmur to right of sternum.

$$V. \begin{array}{l} R. \ -17\ D. = \frac{6}{60} \\ L. \ -17\ D. = \frac{6}{60} \end{array}$$

Moderate crescents, choroids thin and pigment rather patchy.

Case XVI.

Myopia and Syphilis.

H. K. (male), age 23.

In 1885, was under Mr. Hulke's care, and is noted as a case of central choroiditis in both eyes; he was treated with iodide of potassium; his vision is noted as R. $\frac{6}{12}$ and L. $\frac{6}{9}$, and his refraction said to be hypermetropic.

Dec. 2nd, 1891.—

$$V. \begin{array}{l} R. \ \frac{3}{18}\ -{\cdot}75\ \text{cyl.} = \frac{6}{12} \\ L. \ \frac{6}{60}\ -3\ \text{sph.} = \frac{6}{18} \end{array}$$

Note.—This case shows the production of myopia as the result of choroiditis, probably syphilitic. The vision obtained in 1885 without the aid of glasses was the same as that obtained in 1891 with the aid of a — cylinder in one eye and a — spherical in the other.

Case XVII.

Myopia and epilepsy.

A married woman, age 31 (but looking 10 years older).

Does not think that she has ever seen well; the sight has got worse lately. Four years ago "typhoid fever," after which she had her first fit; she has frequent fits now, and during the fits she passes both urine and fæces, and bites her tongue. Had rheumatic fever 10 months ago, and has had rheumatism ever since.

Physical Examination.—Revealed but little, except an unusual relationship between the pulse and respiration, the former being 88 per minute, the latter 30 per minute.

$$V. \left.\begin{array}{l} R. \ -14 \text{ sph.} \\ L. \ \dfrac{-14 \text{ sph.}}{-\ 2 \text{ cyl.}} \end{array}\right\} = \tfrac{6}{24}$$

Note.—I give this case, not because there is any marked cardio-vascular change (except in so far as the epileptic fits may be considered as evidence), but because it corresponds with some points in other cases, in which attacks of a more or less epileptic character occur in myopes.

In this case, I consider that the constitutional disturbance which caused the myopia has now progressed still further and has probably some connection with the production of the fits.

With this case it is interesting to compare two cases published by Mr. Nettleship (B.M.J., 1879).

CASE I.—"Repeated paroxysmal failure of sight in connection with heart disease."

Refraction, myopia, $\frac{1}{40}$.

CASE 2.—Blindness of left eye with changes, the result of retinal hæmorrhage ; thrombosis ; afterwards, repeated attacks of transient blindness of right eye, and contraction of visual field with small opacities in vitreous body ; spontaneous arterial pulsation ; severe aortic disease.

Low degree of myopic astigmatism.

Also a case in Mr. Gunn's clinic of a woman about 35, who was myopic in a high degree, and had frequent attacks of transitory blindness. She had, in addition, well marked heart disease.

CASE XVIII.

Myopia and chronic bronchitis in a child.

J. L. (male), age 7.

Three years ago, attended under Mr. Hulke ; he then had myopia —12 D. ; his myopia has now increased to —15 D. ; he is rather fat, and looks much older than his age ; he shows no definite cardio-vascular disturbance, and is now in fair health ; previously however, he suffered for some years from chronic bronchitis.

Th. Leber (Heidelberg). On the Origin of Inflammation, and the Operation of the Agents which cause it. *Leipzig, Englemann,* 1891.

(*Continued from Vol.* 10, *page* 369.)

In the fifth and concluding section of this important work the author records the results of certain additional experiments concerning the nature of the inflammation-process.

In order to estimate the significance of the various observations already described—the changes witnessed after the introduction into the tissues of various foreign substances—it was necessary to ascertain to what extent a purely mechanical irritation can excite inflammation. Various experiments were undertaken for this purpose.

Mechanical irritation of the cornea of the rabbit produces, neither at the moment nor afterwards, the slightest hyperæmia of the conjunctival vessels, provided that the conjunctiva be not exposed unnaturally to the action of the air by separation of the lids. On the other hand, a similar irritation applied directly to the conjunctiva quickly produces a local injection of the vessels. This appears to prove that when conjunctival hyperæmia follows an injury of the cornea, it is not the expression simply of a reflex-dilatation of the conjunctival vessels.

Stating the matter more broadly, it appears that a simple mechanical injury of a non-vascular tissue does not of itself suffice to excite inflammation in the ordinary sense of that term, but only to induce regenerative changes ; but that in almost every case, perhaps in every case, a certain amount of inflammation does occur, which is not directly attributable to the injury *per se*, but rather to a simultaneous irritation or injury of adjacent vascular tissue, or to disturbance in the healing of the wound through the introduction of foreign substances. If the injury involves considerable bruising and necrosis of the tissue, the products of disintegration are probably capable of exerting a toxic effect

even without the intervention of microbes. In the case of the eye, a simple mechanical injury may lead in other indirect ways to the occurrence of inflammation, *e.g.*, by incarceration of the iris, by escape of the aqueous humour and consequent closure of the filtration angle and increase of pressure within the eye, by injury and swelling of the lens, and consequent interference with the iris.

A series of experiments concerning the reaction which follows an injection into the tissues of an insoluble substance in the form of fine powder is next described. It is well known that such an injection is quickly followed by migration of leucocytes, and absorption by them of the foreign particles, but the mode in which the injected substance induces such migration has not been satisfactorily explained. A direct mechanical irritation of the vessels cannot be assumed, for the phenomenon is not confined to those cases in which the foreign particles are brought into immediate contact with the vessels. The only feasible explanation seems to be that even those substances which are commonly regarded as insoluble are not absolutely so, and that a diffuse chemical action is here in operation.

The experiments show that all the finely powdered substances employed *e.g.*, cinnabar, gold, platinum, silicic acid, barium sulphate, graphite, are able in some degree to induce this reaction at a distance, namely, hyperæmia, exudation of fibrin, and emigration of leucocytes. The effect of such a powder is very much greater than that of the same quantity of the substance in a compact mass. It cannot be due to a greater mechanical pressure, for this would certainly apply rather to the solid mass than to the powder. Neither can it be explained by the multiplication of sharp, irritating points, for on this assumption the reaction should vary directly with the angularity of the particles, which is not found to be the case. It can hardly be due to anything else than the great increase of surface which the subdivision affords and the con sequent increase in the amount dissolved. Substances which in mass are only soluble in extremely low degree, and according excite very slight reaction in the tissues, may dissolve more readily in the subdivided state, and thereby acquire an increased power of exciting inflammation by a diffuse

chemical action. A confirmation of this theory is found in the fact that the same reaction is induced by these several powders, even when they are introduced into the anterior chamber in minute glass tubes, and thus kept from all direct contact with the tissues.

In the next place the source of leucocytes and the manner of their migration is discussed in further detail. Cohnheim's doctrine that pus-corpuscles, except in so far as they multiply by division, are produced exclusively by emigration from the blood-vessels found confirmation in the whole of Leber's researches. That the cornea plays an essentially passive part in the development of suppuration is proved by the fact that a dead cornea introduced within the living body becomes infiltrated with pus just as the living cornea does under the conditions already described. There is, namely, a direct infiltration through the wound in the surface, and there is a marginal infiltration leading to the formation of a ring around the central inoculation. Under these conditions, clearly, the corneal elements themselves can take no active part in the process.

The foregoing statement is no denial of the fact that certain changes occur in the cells of inflamed tissue. What Cohnheim denied, and what no one has been able to prove, is that pus-corpuscles are produced from the tissue cells. The various changes—division, alteration, contraction, and movement of the tissue cells—which have been observed during the process of inflammatory proliferation constitute a different process from that of suppuration.

An explanation of the arrangement assumed by the pus-corpuscles around the focus of irritation was given in an earlier part of the work. (See OPH. REV., vol. X., p. 307.) The evidence in favour of the theory that the pus cells are actively attracted towards the focus of irritation, and not merely arrested in its neighbourhood, is here again minutely reviewed and somewhat extended. Thus in the cornea of the guinea pig, which by reason of its thinness is especially suitable for examination on the warm stage of the microscope, Leber was able to observe the movements of the pus-corpuscles. From five to seven hours after the centre of the cornea had been inoculated with a minute quantity of

bacterial poison the microscope showed a well-marked infiltration of the corneal tissue by leucocytes, and the latter displayed lively amoeboid movements towards the point of inoculation. The movements were intermittent. The average rate was estimated by prolonged observation to be such that a corpuscle would make the journey from the margin to the centre of the cornea, a distance of about three mm., in the guinea pig, in from three to six hours.

A further proof of active movement of the corpuscles towards the centre of irritation was afforded by the experiments in which the irritating substance was introduced into the anterior chamber in glass tubes. The corpuscles entered and gradually aggregated in the tube so as to fill it up, while elsewhere in the anterior chamber no corpuscles were visible. Similar experiments with larger tubes were made in other parts of the body; for instance, a tube containing mercury, covered with glass wool, was placed in the abdominal cavity of a rabbit. Here also a similar aggregation of pus-corpuscles occurred in the tube, while a similar tube containing no irritant substance remained free. Again the experiment was made in another way. A minute capillary cell formed of two thin cover-glasses having between them a film of simple salt solution and at the central point a globule of mercury was introduced into the anterior chamber. A tiny ring of pus-corpuscles formed around the globule of mercury, while elsewhere in the capillary space only a few corpuscles were found scattered. A similar cell containing no mercury collected no pus.

The action of certain chemical substances upon vegetable cells has been termed *chemotaxis*, by reason of its close analogy with *phototaxis*, the similar action of light. The effects produced by irritant substances upon leucocytes are so closely analogous to those on vegetable cells that they also must be included under the name of chemotaxis.

P. S.

(*To be concluded.*)

TH. TREITEL (Königsberg). Effects of Diminished Illumination on the Vision of Amblyopes. *Von Graefe's Archiv., XXXVII. ii, p.* 151.

This is the author's second contribution to the study of functional disturbances of vision. The first (*vide* OPH. REV., X., p. 82) treated of the light difference in the central vision of amblyopes. The tests used in the present observations were Förster's photometer as modified by Treitel (*vide* OPH. REV., V., p. 172), darkening the consultation room and then testing central and also peripheral vision in the diminished light, and further noting the effects of adaptation upon central vision.

In order to avoid misunderstanding as regards light difference our author uses the term "Helligkeitsfunction" (H) to indicate that property of the eye from which it follows that visual power is lessened by decrease in absolute illumination. This is the function which Förster has tested in his observations upon the light sense, but it is not the light sense as defined by Aubert: viz., the power of perceiving the difference between various illuminations (L. D.), which is measured by ascertaining the smallest difference which is perceivable.

Forty-four eyes in 30 patients with affection of the optic nerves (atrophy, papillitis, acute and chronic retrobulbar neuritis, hemianopsia) were tested. Of these but 14 were found to have a low power of H., ranging from $\frac{1}{2}$ to $\frac{1}{625}$; but these eyes were decidedly not night blind, as shown by the test of the darkening of the room till Treitel's own acuity was lowered to 0·1—*i.e.*, reduced more than ten times. With this illumination several of the affected eyes possessed an acuity of vision relatively less reduced than Treitel's own.

No. 1 fell from $\frac{1}{10}$ to $\frac{1}{24}$; No. 4 from $\frac{1}{10}$ to $\frac{1}{30}$; No. 5 from $<\frac{5}{10}$ to fingers at $\frac{1}{3}$m; No. 6 from fingers at 1m. to fingers at $\frac{1}{3}$m; No. 8 from $\frac{20}{100}$ to fingers at 1m; No. 9 from 1 to $\frac{3}{60}$. A truly night-blind eye with retinitis pigmentosa seeing fingers at 4m. in daylight cannot even perceive a hand in a room so darkened.

These patients also showed that they were not night-blind by the way they moved about the darkened room, except one patient, No. 5, whose field of vision was so contracted that even by daylight his power of orientation was greatly reduced.

Another argument is found in the fact that two of the patients, Nos. 9 and 10, actually had better vision when they withdrew from the bright light of the window to a shady corner.

The power of adaptation also shows that these patients were not night-blind. In 19 eyes of 11 of these patients central vision was decidedly improved after some 10 or 20 minutes' adaptation to the diminished light.

The difference between these eyes which possess a low and a high power of H. is to be found in the fact that the former have either very contracted fields, or, if the fields are fair, have large central scotomata.

It is evident that the photometer test of Förster is influenced by the condition of central vision and of the visual field from the facts that in bilateral affections H. may be found lower in the more seriously diseased eye, and that H. may vary in one and the same eye with the increase and decrease of amblyopia. H., as tested by the photometer, depends on the degree of amblyopia, and not on the type of disease of the nerve.

Bjerrum's observation that non-night-blind amblyopes may have a central vision which is less reduced by darkening the room than that of normal eyes is quite in accord with Treitel's experiments, as is also the observation that the same phenomenon is observed in uncorrected ametropia. Treitel expresses this as follows: that equal decrements of form-sense by our usual tests appear smaller the lower the values of the visual acuity which are compared, and accounts for it by the relatively greater number of percipient

elements which are engaged as the visual angle increases. If, instead of testing acuity of vision, light difference be tested in a darkened room, the visual angle being constant, Treitel finds relatively low values from L. D. in amblyopic patients. It must be remembered that adaptation exercises have a much greater effect upon light-sense than upon the form-sense (*vide* OPH. REV., VII., p. 46).

In retinitis apoplectica, albuminurica, and hemianopsia, Treitel's observations agree with Förster's. H. is slightly affected, or not at all. The explanation of this is to be found in the more nearly normal extent of the visual field.

In the amblyopes of Förster's second group (retinitis pigmentosa, amotio retinæ, florid choroiditis), Treitel, like other observers, finds night blindness, but it may be absent in detachment of the retina with greatly reduced acuity, and two of the cases of retinitis pigmentosa exhibited the opposite condition, which Treitel terms nyctalopia, meaning thereby relatively worse vision in bright light.

Thirty-eight glaucomatous eyes of 28 patients were tested. Of these, 10 were night-blind, 6 doubtful, and 22 certainly not night-blind. Of the night-blind eyes, 6 were affected with glaucoma simplex, and 4 with chronic inflammatory glaucoma. It may be urged that glaucoma is a disease of advanced life, and night-blindness may be merely the result of old age. However, nine of Treitel's cases had this symptom only in one eye.

The adaptation of a number of the cases of symptomatic night-blindness was tested, and the visual acuity was found to be unaltered (*i.e.*, not improved) after from 10 to 20 minutes' adaptation.

Night-blindness is therefore a perfectly distinct thing from a diminution of the function of light difference. The latter appears in all diseases of the optic nerve and retina so soon as the central vision is affected, and is merely a sign of the presence of amblyopia. The former is found only in certain definite diseases, and even here is not always present.

Photometrical observations upon the central irritation curve (light minimum, L.M.) were made in 98 eyes of 72 patients, of whom 17 eyes had atrophy of the nerves, 19

neuritis, 4 retinitis, 2 hemianopia, 8 retinitis pigmentosa, 2 ablatio retinæ, 23 chorioditis, and 23 glaucoma. The essential result is that in all affections of the nervous structures of the eye, L.M. is centrally abnormal whenever the central acuity of vision is lowered.

The same holds good for the lesions which are accompanied by symptomatic night-blindness. Treitel has found no case in which central L.M. remained unaltered when central acuity of vision was reduced.

These results are not in accord with Bjerrum's observations published in the Proceedings of the International Congress at Copenhagen, and Treitel believes that the test objects employed by Bjerrum were too large to accurately test central L.M.

Our author criticises the various methods of testing for night-blindness: (1) Measuring the visual function when the total illumination is lowered to a given amount. (2) Measuring the amount of illumination which is necessary to reach a given power of vision. Förster's photometer works by the second of these methods, and is, according to Treitel, a satisfactory instrument for the purpose. But it must not be assumed, as is usually done, that when H. is found lowered to a certain amount ($\frac{1}{12}$ to $\frac{1}{20}$) night-blindness is present, and otherwise absent. The central visual acuity and the state of the field cf vision must be taken into account before the conclusions arrived at by the photometer are accepted. Bjerrum and Treitel worked by the first method, and it gives most satisfactory results. If the illumination be lessened till a normal eye has its vision reduced to $\frac{1}{10}$, none but a night-blind eye can have a relatively greater diminution of vision. If the observation is doubtful, all that is necessary is to test the adaptation, and if the power of vision is not normally raised by 10 or 20 minutes' adaptation, night-blindness is certainly present.

Wolffberg's method of testing by colours in diminished light would be sound if the test objects subtended a constant angle.

Bjerrum's observations, from which he concludes that night-blindness is an affection of L.M., are not to the point,

for Förster's photometer, as employed by him and by Förster, only tests the influence of diminished light upon the visual acuity, and not L.M. The conclusion of the whole matter is that all the evidence goes to show that night-blindness is an affection of the power of adaptation, and of nothing else.

J. B. S.

Th. v. Schrœder. A Case of Acute Dacryo-adenitis during Epidemic Parotitis. *Klin. Monatsbl. f. Augenheilk., December*, 1891.

This case, which occurred in the Ophthalmic Hospital at St. Petersburg, is briefly as follows :—

C. S., female, æt. 27, married 10 years ; one child, who died when 6 months old. With the exception of typhoid fever three years previously, had had no illness. Healthy, well nourished. No syphilis.

On April 6th, after exposure to cold, the patient became ill with slight fever, nasal catarrh, angina, especially on the right side, and bilateral parotitis (mumps) ; salivation was not a marked symptom. On April 10th the left upper lid began to swell, and on April 14th the right followed suit.

April 15th. General condition improved. No fever. Parotitis has diminished.

L.—Great swelling of the upper eyelid, especially in its outer third ; considerable chemosis of ocular conjunctiva ; cornea clear. The up and out movement of the eyeball somewhat limited. In the situation of the lachrymal gland a tumour can be felt, but in consequence of the swelling of the lid its outlines cannot be plainly made out. The lid cannot be everted. Some tenderness over the tumour.

R.—The swelling of upper lid involves only the outer part ; in the region of the lachrymal gland is a small elastic

tumour with an uneven surface, and which, on everting the lid, can be seen covered by nearly normal conjunctiva.

Visual acuity and ophthalmoscopic appearances normal in each eye. Lachrymal secretion not increased. The patient remained in the hospital till April 30th, by which date almost all symptoms had disappeared. The left lachrymal gland was hard and palpable till May 6th. The orbital condition was treated by hot boric acid fomentations, and iodine and vaseline applications to the forehead.

Inflammation of the lachrymal glands, as a sequel or accompaniment of mumps, does not appear to have been hitherto noted. Of the cause of the dacryo-adenitis, we know as little as we do of the cause of specific parotitis: all that can be said is that the structure of the two glands is very similar.

The diagnosis of the lachrymal gland disease was at first rendered difficult by the great swelling of the left upper eyelid, the chemosis, and the limitation of the rotation of the eyeball. The occurrence of exactly similar symptoms on the right side removed this doubt.

J. B. L.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, DECEMBER 10TH, 1891.

HENRY POWER, F.R.C.S., President, in the Chair.

Orbital Hæmorrhages in Young Children.—Mr. Holmes Spicer read this paper, describing several cases recently under observation. The patients are generally hand-fed infants from six to eighteen months of age, who have been brought up on "infant foods." The orbital hæmorrhage occurs spontaneously beneath the periosteum, and shows either as a line of blood-staining at the orbital margin, or as a large effusion giving rise to displacement of the eye and distension of the upper lid. Sub-periosteal extravasations also occur in other parts of the body, generally during an attack of infantile scurvy or "scurvy-rickets."

The form which the orbital hæmorrhage assumes is due to the anatomical arrangement of the periosteum and other structures. The hæmorrhage subsides rapidly at first, but does not disappear entirely, and the eye is left prominent for many months The treatment is essentially that of scurvy; in addition to the ordinary food, juice of fresh meat, a little fruit or vegetable, cod-liver oil or cream should be given. The slighter cases recover rapidly, the more serious ones are slow in progress and often fatal.

Implantation Cyst of the Cornea.—Mr. Treacher Collins showed an eyeball removed from a boy, aged twelve, one year and nine months after a perforating wound of the lower part of the cornea by a stick. Situated partly in the cornea and partly in the sclerotic, at the seat of injury was a large cyst measuring 9·5 millimetres laterally and 5 millimetres antero-posteriorly. This was found microscopically to be lined by laminated epithelium, the most flattened cells being towards the interior of the cyst. Since no

epithelium exists normally in the parenchyma of the cornea, Mr. Collins thought that this cyst had resulted from the implanation of a portion of the surface epithelium into the substance of the cornea, and that this epithelium had subsequently grown and proliferated, some of the cells undergoing mucoid degeneration, thus forming the fluid contents of the cyst.

Hereditary Optic Atrophy.—Mr. Johnson Taylor (Norwich) read notes of four cases of this affection occurring in one family. The history as to heredity was scanty, the maternal grandmother being the only relative whose sight was known to have been defective; she became blind or nearly so when aged 40. The cases described included four male children in a family of eleven, namely, the first, second, fifth, and eighth, the remaining children, five females and two males, being unaffected. In the first case sight failed rapidly but unequally in the two eyes at the age of 27. In the second case failure began at the age of 21, and progressed quickly until vision was reduced to less than 20 J. with the right eye and 18 J. with the left. In the third case defect was discovered at the age of 18, and at that time one eye alone was defective. In the fourth case sight was found to be bad when the child was only 6 years old. For about a year he seems to have been nearly blind, but since then vision has improved, so that with the left eye he can read some words of 1 J.; the right eye sees 20 J. badly. In all the cases there was marked central amblyopia, with colour defect more evident in the central part of the field, and in addition there was some loss of the periphery of the field. The ophthalmoscopic appearances in each case were those of optic nerve atrophy, with slight haziness of the discs and some obscuration of the lamina cribrosa. As is so generally the case, there was a complete absence of symptoms of disease of brain or spinal cord. The three older patients were smokers, but, with the exception of the first, could not be said to smoke excessively. There was no family history of nerve disease.

Dr. Habershon said that he had been much interested in Mr. Taylor's report of his cases. He had some years previously read a paper upon this subject before the Society, in

which he had given notes of a number of cases which he had diagnosed as belonging to that form of optic nerve atrophy first described by Leber. He noticed that in Mr. Taylor's cases there was peripheral contraction of the fields of vision in addition to central scotoma. In the original paper Leber laid stress upon the presence of central defect without any contraction of the fields. He had expressed the opinion in his previous communication to the Society that there were probably two or three factors to be considered in the causation of this disease. In many cases it seemed likely that one of these factors was tobacco.

Card Specimens.—Mr. Juler: (1) Symmetrical Orbital Tumours; (2) Persistent Retinal Hæmorrhages in a Case of Diabetes; (3) Unusual Growth in the Vitreous.—Mr. Johnson Taylor: Intraocular Growth of Doubtful Nature.—Mr. F. R. Cross: (1) Essential Shrinking ("Pemphigus") of the Conjunctiva; (2) Opaque Nerve Fibres Covering the Optic Disc.—Mr. Tatham Thompson: Case of Leber's Hereditary Optic Atrophy.

ON THE CORNEAL REFLEX OF THE OPHTHALMOSCOPE AS A TEST OF FIXATION AND DEVIATION.

BY PRIESTLEY SMITH,

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In the current number of the *Edinburgh Medical Journal* (January, 1892) Dr. E. Maddox publishes an interesting paper on the study of corneal reflexes, and refers to a paper of my own (OPH. REV., vol. vii., p. 349, 1887) as having drawn his attention to the use of the ophthalmoscope in measuring deviations of the eye. Fixation and deviation can so readily be tested by means of the ophthalmoscope that the method has in all probability been employed by many oculists; but I can find no mention of it in any text-book, and I cannot remember to have seen it used in a systematic manner outside my own consulting-room. It may, therefore, be useful to call the attention of the readers of this REVIEW to Dr. Maddox's paper, and to briefly describe my own use of the method.

In my hospital consulting-room is hung, for the guidance of students, a scheme showing the several steps by which a systematic examination of the eyes is to be made. After examining by daylight, and more minutely by focal illumination, the student is directed to use the ophthalmoscope. He is to begin, not as he

commonly supposes, by trying to see the fundus, but in the manner indicated in the following lines :—

3. *Ophthalmoscope.*

A. Use mirror only, at half-metre distance, or nearer. Examine media. Determine position of opacities, if any. For fine opacities use magnifier behind mirror and approach.

Observe action of pupils on direct fixation.

Test fixation-power by observing corneal reflex.

The systematic observation of the corneal reflex commonly occupies only a few seconds, and often gives important information which could not be obtained so rapidly in any other way.

The patient is told to look at the mirror The observer, looking through the mirror in the ordinary way, throws the light on one of the patient's eyes and accurately observes the position of the corneal reflex in relation to the area of the illuminated pupil. He then, making no other movement, quickly rotates the mirror so as to make a similar observation of the patient's other eye. He may transfer the light quickly from one eye to the other several times if necessary. He thus compares the position of the corneal reflex in the two eyes. In many cases it is better to tell the patient to look at the forehead rather than at the mirror; the eyes are less dazzled, larger and better illuminated pupils are obtained, and the position of the corneal reflex in relation to the pupil is more easily seen.

In the large majority of cases the reflex will be seen to stand a little nearer to the inner than to the outer side of the pupil, for, whereas the pupil is usually concentric with the cornea, the visual axis or line of fixation usually lies to the inner side of the corneal axis. Furthermore, in the large majority of cases, the corneal reflexes, whether centric or slightly excentric, will be seen to stand quite symmetrically in the two eyes, and neither of them will change its position in relation to the pupil as the light is transferred backwards and forwards from the one eye to the other. In such cases the observer sees that the patient has, at least for that

particular point and distance, the power of binocular fixation. In certain cases it is difficult to make sure of this in any other way than by observing the corneal reflex. Thus, within the last months two young infants supposed by some of their relatives to be afflicted with a slight squint have been submitted to me for a decision of that question. In each instance a glance with the ophthalmoscope—at which an infant will commonly stare at least as well as an adult—showed the two corneal reflexes symmetrically placed and perfectly steady, and thereby removed all suspicion of strabismus. In each case an epicanthus was the cause of the uncertainty.

In a minority of cases, on the other hand, a want of symmetry in the positions of the reflexes will be observed. Sometimes binocular fixation, though true at the first moment, will be abandoned after a few seconds, one or other eye, or each in turn, making a slight deviation while the other continues to fix. Such a deviation, if of small amount, may easily escape notice, unless specially looked for, but is at once revealed by the altered position of the reflex in the deviating eye. The ophthalmoscope has here, I think, an advantage over the time-honoured taper besides that of convenience. It presents a bright fixation-object only to one eye at a time, and therefore offers a smaller stimulus to binocular fixation than does the taper, which is pictured equally in both eyes at once; hence it is more likely to reveal the signs of excessive or insufficient converging power, or of other latent difficulty in binocular fixation, than is the taper, unless the latter be employed together with exclusion of one eye. Moreover, one can more accurately observe the position of the reflexes in relation to an illuminated pupil than with a dark one, especially if the iris be dark also.

In some cases, again, an asymmetry of the reflexes will be immediately apparent, and will not under any circumstances disappear. Here we can at once get a

further hint as to the condition and comparative value of the two eyes. If, as the light is transferred from the one eye to the other and back again, the illuminated eye always fixes the mirror, and the other always takes up the deviation, we know that both eyes have the power of fixation, though not of fusion. This condition will be found, for example, in some cases of convergent strabismus which, except under minute examination, appear to have been completely cured by operation. If, on the other hand, the one eye persistently fixes the mirror and the other persistently deviates, in spite of the repeated injunction to "look at the light," we know that the deviating eye has little if any power of direct fixation, and will be found on subsequent trial with types to have a very imperfect central vision. This observation, therefore, at once divides cases of convergent strabismus into two groups: those in which it may be possible to restore true binocular fixation, and those in which it will almost certainly be impossible. Again, if both eyes appear to fix the mirror properly when the light is thrown on to one eye, the right, for example, whereas, when it is transferred to the left, this latter shifts its position so as to show a slightly displaced reflex, we may expect to find a pronounced or absolute central scotoma in the latter. The patient is unable to "look at the light" with his left eye unless he receives its image on a slightly excentric part of the retina. A central *colour* scotoma, such as is commonly caused by tobacco, does not, so far as my experience goes, prevent true fixation of a brilliant object—in other words, does not disturb the symmetry of the corneal reflexes. On the other hand, the scotoma left by an acute retrobulbar neuritis certainly sometimes does so.

A paralytic deviation is distinguished from a concomitant deviation by the fact that the asymmetry of the reflexes increases or diminishes when the patient is caused to turn his eyes in different directions. This may be tested, as Dr. Maddox suggests, by causing the

patient to turn his head to the right, to the left, upwards, and downwards, while he still keeps his fixing eye directed to the mirror. Or it may be effected, as I commonly do it, by holding up a finger as a fixation object, at which the patient looks while it is moved, successively to the right, to the left, upwards, and downwards, in the neighbourhood of the mirror. By this latter method both reflexes are of course displaced, and the observer has to estimate the nature of the deviation by comparing the displacements in the two eyes and noting that the asymmetry is greatest when the eyes move in a certain direction, least when they move in the opposite direction. It is hardly necessary to say that the deviating eye is not necessarily the paralysed eye. The latter may, by reason of superior acuteness of vision, make an increased and successful effort to fix, and thereby cause an exaggerated secondary deviation in the non-paralysed but dim-sighted eye.

In the foregoing paragraphs it is assumed that in the routine examination of the eye the ophthalmoscope is used, as I myself always use it, before making subjective tests of refraction and vision, or minute investigation of the movements of the eyes. It seems to me that a rapid objective observation of the refractive condition (by the shadow test), of the media and fundus, and of the presence or absence of harmonious movement in the two eyes, precedes with great advantage the various other steps which lead by question and answer to a complete diagnosis. It affords in the course of a minute or two a better insight into the nature of the case than the patient's statements could give in a very much longer time, and often to a large extent removes the need for these latter. Those who use the ophthalmoscope at a later stage of their examinations will usually discover errors of fixation by other means, but even then the ophthalmoscope and the corneal reflexes may prove useful in confirming the results of other tests

The last item in the scheme already referred to reads as follows:—

9. *Movements.*

Use hand at half-metre distance. Look for "lagging" of either eye.

Test binocular fixation and equilibrium by alternate exclusion of each eye; by prism; by glass rod.*

Test diplopia by strip of white paper and coloured glass.

Observe deviation, also with mirror, by corneal reflexes.

In cases of diplopia presenting no obvious deviation of the eye, the corneal reflexes give a positive objective indication which is of much value, especially when the patient is a bad observer and fails to respond well to subjective examination of the double images.

The immediate result of a strabismus operation can sometimes be ascertained more conveniently by means of an ophthalmoscope and portable lamp than in any other way. Thus, in a recent case of readvancement of a tendon, I was able 24 hours after the operation, when no other accurate test was applicable, to satisfy myself by a glance with the ophthalmoscope through the partly opened lids that a normal position was restored.

A method of measuring the angle of a strabismus by means of the ophthalmoscope, a tape, and the corneal reflexes was described in these pages three years ago (OPH. REV., vol. vii., p. 349). I need not here refer to it further than to say that in my hands it has proved very useful and convenient, and is in constant use.

*Among the many subjective methods now available for the detection of latent deviations,—heterophoria, the rod-test lately introduced by Dr. Maddox (OPH. REV., vol. ix., pp. 129 and 287, 1890), seems to me to be one of the very best.

OPERATION ON MICROPHTHALMIC EYES.

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Mr. Priestley Smith's paper on corneal measurements in the tenth volume of the "Ophthalmological Society's Transactions" gives one food for much thought, and must be of great value in forewarning us of the likelihood of glaucoma occurring in such eyes as we find are below the normal corneal size; it does not, however, help us out of the difficulty in which all ophthalmic surgeons are liable to be placed by the very natural question on the part of a parent: "Are my child's eyes large enough to allow of useful vision?"

Naturally, with the same amount of microphthalmos there may in different cases be a different amount of development of the optic nerve, and with the same apparent amount of development of the nerve there may be different degrees of its power of perception; but of what amount of vision a microphthalmic eye may be capable is a subject about which the books at my command are almost unanimously silent.

The only record I have found of the vision of such an eye with a measurement of the cornea is in "Wolfe's Lectures," p. 91, where there is a diagram of the corneæ in a patient with unilateral microphthalmos who, with the affected eye, could see large objects and count fingers, but could not see the largest type. The measurements are not printed, but the diagrams are life-size, and the right eye has a corneal measurement of 11·5 mm., while the left eye has a corneal diameter of 8 mm. The fundus of the small eye was not normal, as there was a posterior staphyloma and atrophy of the choroid, and it is therefore possible that an eye of the

same size might have a good deal more vision than this one if the fundus were relatively sound.

The publication of the two following cases may, perhaps, induce other surgeons to give us the benefit of their experience in the matter; each has some interest of its own, the first as an additional case of glaucoma occurring in an eye with a 10 mm. cornea, and the second as showing that defective development of an eye does not prevent its being successfully operated on if the necessity arises.

CASE I.—Miss B., aged 42, consulted me first on November 29th, 1888, about her sight, which had always been defective. Twelve years previously she had had an attack of acute pain in connection with the left eye, and, from the description she gave, there can be no doubt that the attack was glaucomatous. It was diagnosed as glaucoma by a medical man, since dead, who relieved the pain by an iridectomy, but the sight had since been very much worse than before the pain occurred; both the eyes were exceedingly small.

The vision of the left eye was only hand reflex, and the optic nerve was intensely atrophied; there was a very large iridectomy extending from the lower outer quadrant to the centre of the upper quadrant; nearly half of the iris had been removed by the operation. The tension when I saw her was normal. The vision of the right eye was fingers at 4 metres, and she was wearing convex lenses of 5 dioptres, with which she could make out words of J.8 at about 3 inches from the eye. The tension was normal, and with the ophthalmoscope the disc seemed to be normal, but red, no doubt from the constant strain on her accommodation. The refraction was + 27 D., and with this lens she could count fingers at 6 metres; but she was not able to take a stronger lens than + 14 D., because of the intense dazzling.

The glass was strengthened to 18 dioptres in February, 1890, and in April, 1891, she was quite comfortable with this, and could see $\frac{6}{60}$ and read words of J.1 at $3\frac{1}{2}$ inches.

I am in hopes that in time she may be able to take a still more ample correction, and that by lessening the strain on

her accommodation I may also lessen the likelihood of the right eye sharing the fate of the left one.

At her last visit the corneæ were carefully measured, and the horizontal measurement was just 10 mm. in each eye, while the vertical axis of the cornea was about 0·5 mm. less.

CASE II.—K. W. is the second child in a family of four; the first died shortly after birth, and was, so far as I know, normal; the two younger children, twins, are well formed, and without any abnormality. The parents are both healthy and well formed, and there is no history of any defect of development in any of the other members of the family. The father is slightly hypermetropic, and is now presbyopic; the mother has myopia of some three or four dioptres.

The child was born in the East, and shortly after birth it was seen that there was something wrong with the eyes, but there was no inflammation, and, except that the eyes were small and the sight defective, nothing attracted attention. When she was about two years old she was taken to Mr. Jennings Milles in Shanghai, and he found that the irides were firmly bound by adhesions to opaque lenses, and endeavoured to break the adhesions by the use of atropine. The atropine, however, caused such severe constitutional disturbance that the attempt had to be abandoned, and as the father was then on his way to take up an important post in New Zealand, Mr. Milles advised that the child should be brought to me on their arrival in the colony.

The child was accordingly brought to me on November 2nd, 1885, when the following condition was noted: both eyes were microphthalmic, and there was some nystagmus, which made it impossible to obtain any accurate measurements of the corneæ, but it was estimated that they were about 7 mm. in horizontal diameter. The pupils were only pinhole, the right one being fairly circular and about 1 mm. in all diameters, and the left elliptical, with the long axis running obliquely down and outwards; this long axis only measured 1 mm., while the short axis was about half as much. The pupils were both firmly bound down by posterior synechiæ to opaque lenses, and sight was confined to power

to follow the flame of a candle. The left eye converged a good deal, and from the age of the patient, who was then only two years and three months, it was not possible to obtain any information other than could be got from what was necessarily a very unsatisfactory examination. Hoping that atropine would be better borne in a temperate climate than in Shanghai, I tried to break some of the adhesions, but the second day of the use of the drops brought on an atropine rash and great restlessness. The drops were at first used in the left eye alone, and were persisted with for four days, but only produced a very slight dilatation of the pupil upwards and inwards. This was, however, enough to show that the lens was milky, and that there was a chalky spot on the capsule at the point of adhesion of the iris. The atropine was after a few days used in the right eye, and caused very little dilatation of the pupil, but the lens was seen to be opaque.

The parents thought the eyes had increased in size since birth, and as I was very uncertain how such badly developed organs would stand operation I decided to wait and watch the case for a time, in the hope that the eyes might become, with the growth of the child, something nearer the size I was accustomed to deal with, though, of course, any considerable increase was not to be expected.

By the following January the nystagmus had considerably increased, and I did not feel justified in waiting any longer, as the child had only perception of light, and I feared that unless it was soon possible to improve the vision she would never acquire the power of fixation. I therefore attempted an iridectomy inwards on the left eye, but found the iris rotten, and only succeeded in tearing away a small portion of the iris tissue, failing to get any satisfactory liberation of the edge of the pupil. The eye stood the operation well, and there was no reaction, but the anterior chamber did not refill for some days, and an anterior synechia formed at the site of the incision.

Encouraged by the absence of irritation, on Jan. 24th, a fortnight after the first operation, I made a similar attempt outwards and cut the synechia, and also did an iridectomy inwards on the right eye up to the margin of the cornea.

The anterior chambers were very slow in refilling, and the left eye healed with an anterior synechia at the site of each incision; but the right, in which the incision was in the corneal margin, healed as it should do, leaving a clean iridectomy.

After these operations the nystagmus was very materially lessened, and I decided to postpone further interference till the child was older, as it would then be more possible to find out what the vision really amounted to.

As a visit to me involved a journey of 700 miles, I did not see the patient again till February, 1889, when she had learned to walk and find her way about the room. The right eye had a central opacity in the lens, but the iridectomy being up to the margin of the cornea she could see round it. The left pupil was very irregular, and there were two anterior synechiæ marking the site of the old corneal incisions, but the opacity being chiefly in the anterior capsule at its centre, she was able to see about as much with this eye as with the other. The left eye converged more frequently than the right, but she seemed, so far as I could make out, to use either eye with equal ease.

She held all objects she wanted to see very close to one or other eye, and had learnt to recognise in this way large letters about an inch square on a set of puzzle blocks that had been obtained for the purpose of testing her vision. She could tell a cabinet photograph of her father from one of her mother, but could not tell one of her mother from one of any other lady. It was impossible to test her vision with fingers, for as soon as she was asked how many were held up she made a couple of guesses and then began to cry. She was able, however, to find scraps of paper about an inch square scattered about the floor, and could with either eye find a tennis ball when it was rolled along the carpet.

Nothing was done at this visit beyond giving convex glasses to correct a portion of what must have been a very high hypermetropia, and I next saw her in January, 1891.

At that time the sight of the right eye was fingers at 0·6 metres, and of the left eye fingers at 0·75 metres; the eyes were once more beginning to show the old nystagmus,

so I decided to needle the cataracts, and on Jan. 31 I needled the right eye.

The opacity seemed to be chiefly capsular, and a good opening was the immediate result; there was no irritation, and on Feb. 3 vision equalled fingers at 1 metre. On Feb. 5 this had improved to fingers at 1·75 metres, but the opening in the capsule was not large enough for me to see any details of the fundus. There was no swollen lens matter, and the lens seemed to have been solely represented by the opaque capsule.

On Feb. 9 the remains of the capsule were removed through a small corneal incision with forceps, and presented the appearance of a cretaceous degenerated capsule, and a clear black pupil was the result of the operation. The eye was slightly red for some days, but by the 26th it was fairly quiet, and the sight was about fingers at 3 metres, improved by the use of a convex 10 dioptre lens. The optic nerve was now seen to be exceedingly small and much atrophied, the vessels thread-like, and the nerve tissue very pale.

On March 3 I cut through the capsule of the left eye, and severed the synechia with de Weker's scissors, assuming from my experience with the right eye that there was no lens substance to swell. There was some hæmorrhage in the anterior chamber for a few days after this interference, but by March 20th this had cleared, and though it was not possible to see the fundus, her sight with the eye was equal to fingers at 2·25 metres, with a lens of 13 dioptres.

The nystagmus had entirely ceased, and it was possible for the first time to get an accurate measurement of the corneæ, which were just a shade under 9 mm. in their horizontal diameters.

The difficulty of measuring her vision still continued, as she was very excitable, and after counting correctly at 2 or 3 metres would, when asked to look again, burst out crying, and put an end to all hope of getting a reliable result. The difference in her sight outside the study was, however, very marked. After a very unsuccessful attempt to test her in the study one day, her father took her away on the top of a tramway car, and while waiting for the car to start she pointed to a figure on the pavement some 30 feet distant and

said, "There's a policeman," and when asked why she thought it was a policeman, said, "Because he has got on white gloves." She was then wearing lenses of 10 dioptres, and the strongest I could get her to take were convex 13, which I ordered for both eyes.

Writing about these glasses three months later, the father says: "They certainly have a wonderful effect on her sight; when going into Nelson Harbour she asked 'what that white thing was,' meaning the light-house tower. She could also see a patch of red paint floating on the water alongside the steamer, as well as several other things she never noticed formerly."

A CASE OF TENONITIS AFTER INFLUENZA; EXCISION; PATHOLOGICAL EXAMINATION OF THE EYE.

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In February, 1890, Professor Fuchs published four cases of tenonitis after influenza, one being suppurative, the other three non-suppurative.* His description enabled me at once to diagnose a case of the same kind which I saw lately in consultation. The case occurred when I was myself away from home recruiting after an attack of influenza, and was not seen by me until about a fortnight after its commencement. My notes, therefore, are necessarily imperfect, but the case is, I think, worth reporting, especially as, through the kindness of Mr. Treacher Collins, I am able to supplement it by a note on the pathological condition of the excised eye.

Mrs. J., aged 44, had influenza at the beginning of June of this year. Towards the end of the second week of the

* Tenonitis nach Influenza. *Wiener Klin. Wochenschr.*, 1890, No. 11.

attack the right lower eyelid became swollen, the lower conjunctiva chemosed, and the eye slightly proptosed. The chemosis was incised, apparently with relief, but the swelling returned a few days later, and then, under chloroform, an incision was made down to the floor of the orbit. No pus was discovered.

On July 8th, I saw the patient for the first time. The right eye was displaced slightly forwards and downwards. The limitation of movement was great in relation to the proptosis, there being no movement upwards. The lower lid was greatly swollen, and the corresponding ocular conjunctiva much chemosed; the upper lid and conjunctiva were unaffected. There was much pain, and the eye was very sensitive to pressure, but there was no tenderness on pressing the edge of the orbit. Fingers could be counted. The state of the media prevented an ophthalmoscopic examination. Iodide of potassium, in thirty-grain doses, three times a day, and hot boracic fomentations were ordered.

When seen by me again two days later the lateral movements of the eye were increased; there was no perceptible reduction of the swelling. The pain had abated so much that the patient thought she was going to get well, but forty-eight hours later the proptosis had distinctly increased, and the lower half of the cornea was buried by the chemosed conjunctiva; the pain was intense, and the patient clamoured for something to be done. Though palpitation did not give me the sense of fluctuation, I made, under chloroform, free incisions by the sides of the globe down to the orbit, having first divided the external canthus. There was no pus, but the incisions gave temporary relief.

On July 14th, as vision was abolished and the patient had had no sleep during the previous night owing to continuous pain, I enucleated the eye.

The operation was one of unusual difficulty, the globe being firmly adherent to Tenon's capsule by plastic exudation; the posterior and inferior portion of the eye was enveloped in a fibrous-looking mass, which involved the optic nerve. The following is Mr. Treacher Collins's report of the pathological examination of the eye:—

"The mass of tissue external to the globe consists of

bundles of fibrous tissue irregularly arranged, with round cells scattered amongst them. These are mostly arranged in clumps, in the centre of which they are densely packed and at the periphery are diffuse. There are pieces of the ocular muscles contained in it, and they are much infiltrated with round cells. The retina is detached from the ora serrata to the optic disc. There is considerable diffuse round-cell infiltration of the ciliary body and choroid throughout, but hardly any of the iris. The suprachoroidal lymph space is much enlarged, especially anteriorly. On one side there has been slight hæmorrhage into it. The cornea and lens appear healthy. The vitreous is much shrunken. The optic nerve shows some hyper-nucleation. I think there can be little doubt that the extraocular changes are inflammatory, and very likely began as a tenonitis, which has spread outwards to the cellular tissue of the orbit and inwards to the choroid and ciliary body, the inflammatory changes in which have produced shrinking of the vitreous and detachment of the retina."

Th. Leber (Heidelberg). **On the Origin of Inflammation, and the Operation of the Agents which cause it.** *Leipzig, Englemann*, 1891. (*Concluded from page* 27.)

Does the same influence which governs the movements of the leucocytes outside the vessels cause their migration from the vessels? Does it act upon them while they are still within the vessels? These questions were investigated by introducing small quantities of the irritant substances previously employed into the interior of a blood-vessel, and doing this in such a way that the results should be complicated as little as possible by damage to the wall of the vessel, either by contact with the irritant or by the operation itself. For example, the open end of a fine glass tube was introduced through a minute aperture into the jugular vein of a rabbit, and pushed in until its other end, which was closed and bent into a hook, reached the aperture. By this

means the tube communicated by its open end with the blood current, while its closed end retained it in position, and plugged the aperture. Near the closed end was a globule of mercury; the rest of the tube was filled with common salt solution. The skin wound was kept aseptic and closed by a suture. Examination a few days later showed the tube to be filled from its open end to within a certain distance of the mercury with aggregated leucocytes. There was no trace of a thrombus in the vein. This was not a mere example of adhesion of leucocytes to the surface of an intruding foreign body, but an active migration along the cavity of the tube towards the source of irritation; in short, a production of pus direct from the blood stream: an expression of attractive influence acting directly upon the circulating leucocytes.

That amœboid movements play an important part in the migration of leucocytes has been shown by several previous investigators. The leucocytes, before leaving the vessels, have been seen to travel round from one side of the vessel to the other in the peripheral stationary layer of the blood, and even to move along the wall in a direction opposite to that of the blood stream. Important in this connection is the fact that quinine and some similar substances have been found to paralyse these amœboid movements, and to retard or arrest the migration of the cells. Further, it is noteworthy that, together with their power of movement, the leucocytes lose their power of adhesion to the wall of the vessel which contains them. So long as the leucocytes retain their inactive globular form, so long do they apply to any opposing surface a minimum area of contact; but by means of their amœboid changes they can, under certain circumstances, apply themselves much more extensively, and thereby greatly increase their adhesive power to any opposing surface. It would appear, then, that in the circulating blood they retain their globular form because there is here no irritant to act upon them, whereas, under conditions of abnormal irritation acting from without upon the vascular wall with which they come in contact, they are excited to amœboid movement, and thereby to adhesion and diapedesis. As regards the chemical and

microbic irritants here chiefly in question, it is evident that they act upon the vessels and their contents from without, and the outward movement of the leucocytes is satisfactorily explained by the fact that the concentration of the irritant increases in this same direction.

The formation of pus in the anterior chamber, in association with corneal ulceration, has been difficult to explain. Clearly the hypopyon depends on the corneal ulcer, and yet there is no evidence to show that the pus proceeds from the cornea into the chamber either by rupture of Descemet's membrane or by migration of corpuscles through it. The evidence is entirely against this supposition. Pus in the substance of the cornea is the result either of suppurative ulceration or infiltration. A true corneal abscess has, according to Leber, no existence. Long and minute observation as to this point, both clinical and experimental, has shown that the so-called abscess is always really a result of ulceration, and that many of those collections of pus which are commonly called abscesses, and are supposed to be located in the substance of the cornea, are really aggregations adhering to its posterior surface at the part where a circumscribed necrosis of the endothelium has been caused by the action of the diffusible irritant substance entering from without. No trace could be found either of emigration of pus through Descemet's membrane or of a transformation into pus of the endothelial cells. On the contrary, it was clear that the pus-cells were due to the escape of leucocytes from the vessels of the iris and from those immediately surrounding the angle of the chamber. Hypopyon, therefore, is the result of the action on these vessels of an irritant substance which reaches them by diffusion from a distant source in the cornea.

Numerous observations specially directed to the point showed that the exudation in the anterior chamber is completely free, in the earlier stages at any rate, from microbic elements. Moreover, it was proved that similar exudations excited by chemical irritants were sterile. It is, therefore, conclusively proved that even in the case of microbic irritation, the soluble irritant is capable of permeating the tissues and exciting purulent exudation at a distance from the point of inoculation.

In the course of the many experiments which have been referred to, numerous observations were made on the process of inflammatory tissue-growth. The changes in question were chiefly those of encapsulation and regeneration. A foreign body may become encapsuled by simple incrustation, or by the formation of new connective tissue around it. Oxidisable metals, such as iron, copper, and lead, are apt to become encapsuled by an incrustation of an insoluble oxide or other compound of their own substance. In such cases the formation of new tissue around them is commonly so slight as to be little, if at all, discoverable by the naked eye. The microscope, however, shows that these substances, and even others which are more inert—pure gold, for example—become covered, even after a few days, with a delicate single layer of endothelium. When the substance is introduced in the finely-divided state instead of in mass, it becomes encapsuled in a more pronounced manner. When its irritant property is sufficient to excite suppuration, a proliferation of connective tissue occurs in course of time around the exudation, so as to produce, as it were, a capsule around the abscess. When the foreign body is introduced so as not to be entirely within the eye, the proliferation of tissue around it is so effected as to result in its extrusion. An instance of this process is seen in the inevitable casting forth of the artificial cornea which surgeons have attempted to place in the eye in cases of leucoma.

Another form of tissue-growth common in the inflammatory process is the formation of new blood-vessels. This takes place always towards the point of maximum irritation, but only occurs where and when the irritation is not sufficiently great to cause suppuration—*i.e.*, at a certain distance from the point of maximum concentration, or in a late stage of the process. The new vessels always grow in the form of offshoots from pre-existing vessels. In the cornea the growth of new vessels may be induced by various irritants, chemical and microbic. Clinically the process is well known. Experiment shows that foreign bodies of various kinds in the cornea or anterior chamber, when not too actively irritant, may become coated over with newly-formed blood-vessels, and that such new vessels may even

advance along the interior of a minute glass tube containing the irritant. Like the movement of the leucocytes, the growth of the vessels is always towards the centre of irritation.

Again, other forms of tissue-growth may be accelerated by chemical irritation. For example, a subcutaneous injection of phlogosin into the ear of a rabbit has been found to produce an overgrowth of hair in the zone surrounding the necrosed area. In vegetable tissues also the same thing is frequently met with; the galls and wart-like growths common on many plants are produced by the introduction of the irritating secretions of certain insects into the living tissue.

The softening and breaking down of tissue which occurs in purulent inflammation, and for which the name *histolysis* is proposed, appears to depend on a chemical process analogous to that of digestion, and due to the action of the leucocytes. The mechanical action of the infiltrating cells is no doubt auxiliary, but does not of itself suffice to explain the fluidification of solid living tissue. Experiment shows that purulent exudation completely free from microbes contains a ferment which softens and dissolves fibrin, gelatine, and dead animal tissue; and further, that the leucocytes are the source of this ferment.

In the last chapter of his book Leber briefly summarises the conclusions to which his long-continued researches have led him. The inflammatory process is purposive; it is a struggle of the tissues and organs of the body against the influence of injurious substances, and especially against parasitic invasion; it is the expression of certain active changes which are excited by the invader, and which serve both for its repulse and for the repair of the mischief done. This conception, held by Leber for nearly twelve years, has been advanced meanwhile by many others, and is now almost universally accepted. To Metschnikoff and his doctrine of phagocytosis belongs the credit of having widely extended the general appreciation of this idea, although it now appears that he has attributed more than its real importance to that particular phenomenon.

Inflammation is a complex process. It includes many

different changes, and all serve towards the same end. This is most evident in acute suppurative inflammation, where the intensity of the irritation calls forth a proportionately intense resistance. The toxic agent produces a local dilatation of the neighbouring blood-vessels, slows the blood stream in these vessels, causes the leucocytes to aggregate on the vessel-wall, and, under chemotactic influence, to make amœboid movements, to pass through the wall towards the source of irritation, and to aggregate in large numbers around it. The old saying, *ubi stimulus ibi affluxus*, applies no less truly to suppuration than to inflammatory hyperæmia and proliferation of blood-vessels; it finds its explanation in the chemotactic influence of the irritant. If, on the other hand, the toxic agent is comparatively inert, so that it suffices to induce a migration of leucocytes, but not to paralyse and destroy them, it is, if sufficiently subdivided, taken up and dissolved, or carried away by the leucocytes.

A further purposive factor in the inflammatory process is that by which an invading micro-organism is checked in its growth and killed. In this active destruction the leucocytes apparently play an important part, but it is likely that other changes are also concerned—*e.g.*, an increased alkalinity of the fluids, the abstraction of acid, or the cutting off of nutrient matter.

The causes of inflammation, then, are a multitude of substances foreign to the body, which, when introduced, disturb or injure its constitution. Their activity differs greatly both as to quality and quantity, and the inflammatory reactions which they induce differ in like manner. In the case of certain substances—*e.g.*, the diphtheritic poison, though the necrosing power is great, the power of exciting the leucocytes is comparatively small; in other words, the reaction of the healthy organism appears to be insufficient to cast off the invader by the suppurative process. It is probable, nevertheless, that this special form of reaction is the one best adapted to meet the special requirements of the case.

The inflammatory process never extends simply as such; its extension always depends upon the extension of the

underlying cause. Its ultimate product, pus, is in itself innocuous. The nocuous property which pus often possesses depends on the organisms which it contains. Aseptic pus may, without harm, be left in the tissues to undergo absorption.

Seven pages, containing fifty-eight finely executed lithographic drawings, representing many of the microscopic appearances described, complete the volume.

Our notice of this important work has necessarily been confined to its most prominent points, and has left unmentioned an infinite amount of detail, both as regards the author's own researches and his very numerous references to the publications of others. To those who would minutely study this all-important subject—the causes of inflammation and their modes of action—Prof. Leber's original work will be an indispensable companion.

P. S.

Bernhard Dub (Vienna). Zonular Cataract. *V. Græfe's Archiv.*, *XXXVII.*, iv., p. 26.

With the object of throwing light upon the time of life at which zonular cataracts originate, Dub has measured the equatorial diameter of a series of such cataracts in Prof. Fuchs' clinique, and has also measured the diameter of the crystalline lens in the eyes of children.

In measuring the cataracts the method adopted was *à double vue*, carried out in the following ingenious manner. If the left eye be the one affected, a millimeter scale is placed about the patient's left temple behind the outer canthus. The observer illuminates the fundus of the eye by an ophthalmoscope held before his own right eye, and keeps his left eye closed. Then opening his left eye he squints inwards, so as to fix the scale with the left eye, while the right still observes the cataract against the red background of the illuminated fundus. The position of the scale is such that the homonymous diplopia thus evoked makes the image of the cataract seen by the right eye coincide with that of the scale seen by the left, and the

only thing further required is to make the correction necessary to neutralise the enlargement produced by the magnifying power of the patient's cornea. Dub assumes this to be $\frac{1}{7}$ (on Helmholtz's authority), and corrects his figures accordingly.

The corrected measurements for 10 zonular cataracts, in patients varying from 8 years of age to 24, are as follows :—

No.	Age.	Equatorial diameter.
1	11	4·4 mm.
2	16	4·6 "
3	8	4·7 "
4	13	4·8 "
5	11	4·8 "
6	10	5· "
7	10	5·2 "
8	24	5·2 "
9	18	5·5 "
10	9	5·6 "

In all 10 cases the size of the cataracts was the same in the two eyes.

As regards the size of the lens at different ages, the only literature of importance is that contained in Priestley Smith's paper in the *Ophthalmological Society's Transactions*, vol. iii., and he has only been concerned with adult eyes. Treacher Collins has measured the fœtal lens (*Ophth. Hosp. Reports*, vol. xiii.). He measured after hardening in Müller's fluid. Dub measured as soon after death as possible, after previous immersion in turpentine. Thirty-three individuals, varying in age from 10 months to 12 years, came under observation. The largest lens (ætat 12 years) measured 8·8 mm. The smallest (ætat 10 months) 6·9 mm. The average diameter of three lenses under 1 year old was 7·46 mm. The average of nineteen over 1 year and less than 2 years was 7·87 mm.; of four over 2 years and less than 3, 8·2 mm.; and of three over 3 years and less than 4, 8·46 mm.

The relation of the size of the lens to the age of the individual is not so definite as it is to the height, but the averages given above show a steady growth of the lens during childhood. As regards height, Dub's observations

show a very definite proportion between that and the diameter of the lens:—

Height of from	Corresponds to a lens diameter of
50 to 60 cm.	7·4 mm.
60 „ 70 „	7·82 „
70 „ 80 „	8·04 „
80 „ 90 „	8·17 „
90 „ 100 „	8·40 „

Dub collates his observations with those of Collins and Priestley Smith, showing thus the gradual increase of size of the lens from the fœtus of 4 months to the man of 89.

The conclusion arrived at is that the commonly received views (that zonular cataracts begin in the first two years or so of extrauterine life, and that the peripheral fibres are the parts affected) cannot both of them be true. If the disease begins *post partum* the periphery cannot be the part affected, for the lens is already larger than any of the cataracts measured by Dub; or if the periphery be the part affected, the cataract cannot originate after birth. The only point disregarded in this argument is the possibility of a shrinkage of the central portions of the lens sufficient to make the difference between the size of the lens during the first two years of life and the size of the cataracts as measured by Dub. He does not, however, consider such an amount of shrinkage as at all probable; it would amount to more than a third of the whole diameter of the lens between the ages of one and two years. Observations upon the shrinkage of the lens are much to be desired, and these cases of zonular cataract are just the material that is required to make them.

This careful and accurate series of observations will, no doubt, strengthen considerably the tendency which already exists, and is due in part to the observations of Schirmer, to attribute an intrauterine origin to the vast majority of zonular cataracts. All authorities are agreed that the opacity does not originate inside a peripheral layer of transparent lens substance.

J. B. S.

J. JUNG (Heidelberg). **Tubercle of the Choroid and Glioma of the Retina.** *V. Graefe's Archiv., XXXVII.*, iv., *p.* 125.

Two cases, one chronic tubercular affection of the choroid and the other glioma of the retina, are here accurately described, chiefly from a pathological and microscopical point of view. In his introductory remarks the author refers to the difficulty, sometimes very great, of distinguishing between these two diseases; indeed, in the present instance the clinical diagnosis was wrong, and it was not until the eyes had been excised and the growths examined under the microscope that their true nature was ascertained.

Case I.—E.S., *æt.* 3, first seen on December 2nd, 1885. The history was that about three months before, the right eye had begun to inflame, and the inflammation had lasted for some weeks. The eye was now rather soft, the anterior ciliary veins unduly prominent, the pupil irregular owing to numerous posterior synechiæ, the iris atrophic, and there was a yellow reflex from the vitreous, due apparently to a growth lying close behind the lens. No retinal vessels were seen on its surface. The globe was removed on December 18th. The optic nerve, where it was cut across, was much thickened, and of an unhealthy grey colour : as this condition suggested intra-ocular tumour the stump of nerve, almost as far back as the optic foramen, was removed, and although at this level there was no thickening, the grey appearance was still present. The wound healed slowly, but without recurrence of the growth. Signs of pulmonary tubercle had, however, by this time shown themselves, and the child died about six months after the operation.

The globe when hardened presented the following macroscopical features : Its size was normal ; the cornea, iris, and the temporal side of the sclera seemed unchanged, but on the nasal side the sclerotic was thickened. The ciliary body and the iris, whose anterior surface was covered with a thin layer of exudation, were both unnaturally thick ; the anterior chamber was normal, but the posterior was filled with a

yellowish inflammatory mass. The nasal side of the choroid in its anterior half was about 1 mm. thick, slightly separated from the sclerotic, of a grey colour, and had a few small nodules in its substance. The posterior half of this side was transformed into a rounded prominent tumour, measuring in its transverse diameter 10 mm. and in its sagittal diameter 8 mm; this had grown completely over the optic disc, involving the substance of the nerve. The retina was here completely detached, and in parts so much intermixed with the tumour as to be indistinguishable from it. The temporal side of the choroid was uniformly thickened, and, like the other half, was beset with round nodular swellings.

The microscopic structure of the growth is described at great length; we record here its most important features.

There is considerable cell infiltration of the cornea, especially in its deeper layers. The cells are oblong and round, the latter as a rule more deeply stained than the former. At the sclero-corneal margin on the nasal side, *i.e.*, on the side of the choroidal tumour, there is a circumscribed collection of small cells containing round nuclei, and amongst them a giant cell with epithelial ones grouped about it. This little nodule is evidently a miliary tubercle.

The iris shows considerable cell infiltration and is bound to the anterior capsule of the lens: two small miliary nodules are present in it, one of them showing caseous degeneration. The pigment layer of the iris is irregularly increased and has spread on to a layer of newly-formed tissue interposed between it and the lens and filling up the posterior chamber. The anterior part of the lens is unchanged; farther back, however, the lenticular fibres are separated from each other and the posterior capsule is folded on itself. The epithelium is irregularly continued over the posterior surface of the lens.

The ciliary body and ciliary processes, especially on the side of the choroidal tumour, are greatly thickened, and infiltrated with new cells. In the ciliary body, on the temporal side, are two prominent nodules with a structure similar to those already described. The cylinder epithelium of the *pars ciliaris retinæ* has in some places a normal

appearance, while in others it is so much and irregularly increased that its original structure is no longer recognisable.

The choroid, in its outer layers, shows much round-cell infiltration, and there are numerous large vessels: in the inner layers, on the other hand, where the development of new cells is very slight, these are mostly spindle-shaped or epithelioid in character, and no vessels are to be seen. The cells on the inner surface are arranged roughly in radiating lines, while the more externally placed round cells show no such formation. Patches of caseous degeneration and numerous giant cells are found in most of the nodules scattered throughout the choroid ; the giant cells contain many nuclei and are usually pigmented. On the nasal side and invading the nerve, as before mentioned, the thickening has assumed the form of a definite tumour. This is made up of round, spindle-shaped, and epithelial cells intermixed with numerous giant cells.

The hyaloid membrane is intact except in the region of the *ora serrata*, where it is broken and perforated by a tubercular mass projecting from the thickened choroid into the vitreous.

The retina is entirely disorganised ; hardly any trace of its normal structure is left ; here and there indications of its original constituent layers can with difficulty be made out, and the remains of a few vessels are also seen. The pigment epithelium is replaced by a delicate sheath of fibrous connective tissue containing in its meshes a few irregularly shaped pigment cells.

The sclerotic, although presenting unusual cell development, is free from tubercular degeneration.

The transverse diameter of the optic nerve was much increased, but this was found to be due more to thickening of the sheath than of the nerve itself. Small yellowish nodules both in the sheath and the nerve substance could be seen with the naked eye. Sections of the nerve reveal an unusual number of small cells lying in a stroma which, under a low power, appears homogeneous, but when highly magnified is seen to be a delicate fibrillar network. The nerve substance proper is, close to the globe, com-

pletely atrophied, and is studded with small miliary tubercles, most of which show giant cells, but none caseous degeneration. The sheath of the nerve is similarly affected, showing tubercular deposit in different stages; the nodules of the sheath have here and there broken down into soft cheesy matter, thus indicating a more advanced stage of disintegration than those of the nerve itself. Sections of the optic nerve very far back discover a few fibres which are comparatively healthy, but for the most part the disease is here also very pronounced.

Tubercular bacilli were detected in the choroid, both on the temporal and nasal sides, in the tumour, and in the remains of the retina.

In commenting on the case, Jung draws attention to the fact that the giant cells were found to contain pigment. Hitherto, this condition has not been seen in chronic tuberculosis of the choroid, at least he can find no notice of it in the literature of the subject. The phenomenon has, however, been observed in tubercle of the iris, as well as in acute miliary choroidal tuberculosis. It is also noteworthy that, contrary to the general rule, the hyaloid membrane has been more encroached on by the disease than the sclerotic; it frequently happens that the former is left comparatively intact, while the late suffers to a much greater extent. In the present instance we find just the reverse order of things. A further point of interest in connection with this case is the fact that the whole extent of the optic nerve was involved. Several writers, to whom the author refers, describe tubercular affection of the choroid spreading backwards into the nerve, but in no authentically reported instance has this reached beyond the lamina cribrosa. Whether the choroidal disease was primary, or secondary to tubercle elsewhere cannot definitely be determined, but the latter hypothesis is the more probable of the two.

Case II.—E. M., *æt.* 4. The history had not been recorded in the hospital books, and there was now no means of obtaining it. The notes are shortly as follows:—May 17th, 1885. Right purulent iritis, probably of a tubercular nature, with small yellow nodules and hypopyon filling a third of

the anterior chamber. An iridectomy was performed on June 3rd, and at first did well, but about a week later a greenish yellow sheen, apparently from the vitreous, was noticed, and the scleral wound had become cystic ; the globe was therefore excised. In drawing the eye forwards previous to dividing the nerve, the sclerotic burst at the site of the cicatrix, and a greenish fluid escaped. The nerve was very hard to cut, and on removal of the globe was seen to be greatly thickened. A further piece, as far back as the optic foramen, was taken away ; this also was degenerated. The wound healed, but not without some swelling of the lids and increase of temperature. On August 7th the child was brought back with a large recurrence of the growth in the orbit. No further operation was undertaken. The patient died on November 27th of the same year, but nothing more is known of the progress of the disease during the interval between this date and the time when she left the hospital.

Sections of the hardened globe showed that the retina was detached and enormously thickened, so that it projected forward as a large tumour, filling the greater part of the space normally occupied by the vitreous. A thin process of the growth had pushed forward over the ciliary body and ciliary processes, and, on the nasal side, lined the hinder surface of the iris. Posteriorly it was intimately attached to the optic nerve, and could not be separated from it.

Microscopically, the growth, which was stained with hæmatoxylin and eosin, consisted of cells containing round nuclei, and placed so closely together that no intercellular substance could be made out. Marked changes had occurred in the vessels of the tumour ; as a rule all the coats, but more especially the inner one, were much thickened ; the calibre of the vessels was usually much diminished, and in several instances this contracting process had gone on to complete obliteration ; in other vessels, again, there was neither thickening of the coats nor contraction of the lumen but the wall seemed necrosed and badly defined ; sometimes blood corpuscles were seen in its substance ; sometimes it had ruptured and allowed the blood to escape into the neighbouring tissue. In the midst of the growth it was possible to detect traces of degenerated retina ; thus remains

apparently of the fibrous layer, of the internal limiting membrane, and of the pigment epithelium could be seen, but there was no indication of nervous elements.

The choroid is, for the most part, only slightly altered : its vessels are occasionally enlarged, and a small amount of cell infiltration has taken place.

The iris is thickly infiltrated with round cells ; as already mentioned, a part of its posterior surface is covered by a process of the glioma, and between the cells of the latter are scattered the pigment cells of the iris stroma. Some glioma cells are found in the ligamentum pectinatum. The pigment layer on the temporal side is much atrophied, but on the nasal half fairly well preserved.

In the outer and inner angles of the anterior chamber there is an aggregation of cells which correspond in all respects with those of the new growth ; little groups of similar cells are also found lying on Descemet's membrane. Both lens and cornea have been invaded to some extent by the disease. The sclerotic is normal.

To the naked eye, one-half of a tranverse section of the optic nerve appeared yellowish—the other half grey. The grey part was mostly atrophic, but in the peripheral margin and in the zone surrounding the central vessel there were very distinct groups of glioma cells. There was hardly any trace of vessels to be seen on this side. The yellow part showed extreme gliomatous degeneration, and the vessels were much enlarged, offering a marked contrast to the opposite half of the nerve. Sections farther back from the globe revealed glioma infiltration, for the most part in close relation with the central retinal artery, and enclosed by a layer of atrophic nerve substance.

Inasmuch as the appearance of the eye, before enucleation, suggested tubercular disease, it was thought advisable to look for tubercle bacilli, but none were found.

The paper is illustrated with several good plates.

N. M. ML.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, JANUARY 28TH, 1892.

HENRY POWER, F.R.C.S., President, in the Chair.

Case of Tuberculosis of the Iris, Suspensory Ligament, and Retina.—This paper by Mr. R. L. Knaggs (Leeds) was read by the Secretary. A boy, aged 9 months, suffered from iritis of a quiet type, with 14 to 20 white nodules in the iris. Those in the lower part of the anterior chamber coalesced, forming a large yellowish mass which protruded at the sclero-corneal margin. The eye was excised, but the child died seven weeks later from tubercular meningitis. Sections of the eye showed that the iris had been transformed into a tuberculous mass, in which were many well-marked tubercles. The inflammatory growth had thinned and bulged the outer tunic of the eye, had penetrated the uveal pigment layer at a point just in front of the ciliary body, had passed through the suspensory ligament, and had been stopped abruptly at the hyaloid membrane. The canal of Petit was filled with inflammatory exudation, and contained several tubercles in which giant cells were well marked. The suspensory ligament did not seem to have undergone any alteration, although embedded in tuberculous tissue. In the lens were spaces filled with inflammatory cells, and in the retina there was an inflammatory focus situated between the nerve fibre layer and the pigment layer, the latter being quite unaffected. The case was recorded not only as a contribution to the literature of tubercular iritis but because of the bearing it had upon questions connected with the suspensory ligament. Drawings of the pathological conditions were exhibited.

The Etiology, Prognosis and Treatment of Disseminated Dot Cataract.—Mr. C. Wray (Croydon) read this paper, in which, after noting that the literature of the subject was very scanty, said that in its commonest form this affection was characterised by very numerous punctiform opacities, generally less than 0·5 mm. in diameter, symmetrically arranged

in the crystalline lenses. The dots were generally most plentiful towards the equator, and in some instances were confined to that region, the central part of the lens being quite free. Sometimes there were also streaks of opacity, arranged without reference to the anatomical structure of the lens; occasionally the dots were so minute, and situated so peripherally, as to be overlooked unless carefully searched for. The following varieties of dot cataract had been noticed: (1) The simple form as above described, occurring in young subjects, with no other changes suggestive of lens degeneration; (2) the simple form complicated by the presence of opaque streaks arranged without reference to the anatomy of the lens; (3) vacuoles present in addition to the dots and streaks; (4) the above conditions with degenerative changes suggesting ordinary advancing cataract. The affection was most easily recognised in childhood; in later life it might be mistaken for developing senile cataract. There was nothing in the history or condition of the patients to account for the lens changes; the simplest view was that they were merely transmitted structural peculiarities, like the white dots found on the finger nails. This explanation seemed the more probable, since in each case in which the condition was found in children, it was present in the mother. In regard to prognosis, two points were noteworthy; the non-deterioration of vision in those parents who were affected, and the presence of the dots unchanged in one patient who had advanced nuclear (senile) cataract. In only one instance had the question of treatment to be seriously discussed, and in this, the vision with correcting glasses being equal to the patient's requirements, no active interference was advised. If in any case the sight were not sufficient for the requirements of the individual, the rules applicable in the treatment of lamellar cataract would apply. Nine cases were recorded, in nearly all of which the refraction was ametropic. In six cases in which the children were discovered to have disseminated dot cataract, the same condition was found in the mother. In no instance in which it was present in the child was it absent in the parent. In two cases it was present in a parent, once the father, once the mother, but absent in the offspring.

Mr. Sydney Stephenson said he had seen a number of cases like those described by Mr. Wray, and in several he had noted congenital defects of the eyes, for example, opaque nerve fibres, persistent pupillary membrane, etc. He asked if Mr. Wray had found such defects in any of his cases.

Mr. Lang said that, in his experience, the lens was easily extracted in cases of dotted cataract with nearly clear cortex, and he had consequently no hesitation in advising operation.

Mr. Lawford thought the vacuoles in the lenses, alluded to by Mr. Wray, were not uncommon in cases in which no other evidence of lenticular change was forthcoming. He had observed some cases for three or four years, and had been unable to detect any increase in size or number of the vacuoles. He asked whether their presence had any significance.

Mr. Doyne was unable to agree with Mr. Lang as to the ease with which these dotted cataracts could be extracted. He had found considerable difficulty in removing the cortical portion of the lens.

Mr. Gunn inquired if the dots of opacity were very numerous, and Mr. Juler asked if the condition was generally non-progressive.

Mr. Wray, in reply, said that the dots in the lens were generally present in large numbers. He thought that the opacities in most cases remained nearly stationary. He had seen one case in which there was a persistent hyaloid artery.

Card Specimens.—Mr. Critchett : Case of Conical Cornea treated by Galvano-cautery without Perforation.—Mr. Gunn : Apparatus for Illuminating the Eyeballs from behind.—Mr. Juler : Microscopic Demonstration of Hyaloid Growth from the Lamina Vitrea of the Choroid.—Mr. Higgens : Tuberculosis of Iris.—Mr. Ernest Clarke : Case of Unusual Retinal Detachment (?) Neoplasm.

CASE OF SARCOMA OF THE IRIS REMOVED BY OPERATION.

By W. Charnley, M.D., Shrewsbury.

The following case was at first considered to be a vascular or cavernous tumour of the iris, but microscopical examination showed it to be a sarcoma.

The patient—a lad of 16—was first seen by me in November, 1889.

I then found on the lower and inner part of the iris of the right eye a small hemispherical tumour about $\frac{1}{20}$ inch in diameter. The iris was grey; the tumour overlapped its margin, projecting well from its surface, and was brownish-grey in colour. The surface showed lines radiating from the centre, giving it somewhat the appearance of the optic disc in intense neuritis. On the surface were several specks of vascularity. Iris freely movable. Fundus oculi, normal; V. = $\frac{6}{9}$ and J.1.

The general health was good, and there was no family history bearing on the case.

The history of the tumour is as follows:—

Eleven years ago he had consulted another oculist about it. For many years afterwards the tumour remained unchanged; but lately he had noticed that red spots had appeared on it, and there had been occasional obscurations of sight. I did not see the patient again for 18 months, *i.e.*, till May, 1891. He then came complaining of dimness of sight. I found the tumour certainly increased in size, and I also found an effusion of blood at the bottom of the anterior chamber. His vision was, when I saw him, normal,

but he had had occasional attacks of dimness. The effusion of blood had occurred without shock or blow.

In view of these symptoms I advised the removal of the tumour.

I regarded it as a vascular tumour of the iris similar to two cases recorded by de Wecker in the *Traité Complet d'Ophthalmologie.* He calls them a form of granuloma, and says they are very rare.

Hirschberg and Steinheim describe a similar growth under the name of "Tumeur telangiectasique de l'iris."

De Wecker's first case was a male adult: the tumour was furrowed with vessels, an appearance corresponding to the radiate look of the surface in my case. A curious feature in this case was that the patient by simply shaking his head could make the tumour bleed so freely as to fill the anterior chamber with blood, with consequent almost complete loss of sight. De Wecker advised iridectomy, but the operation was declined. A year later the eye was lost and had to be removed. I was disposed to regard my case as on the same plane as these two cases of de Wecker's, and especially like the first, with whose appearance and symptoms those of mine closely corresponded.

In June, 1891, I performed an iridectomy and removed the tumour completely. There was no difficulty in the operation.

I submitted the growth to my friend, Dr. Webb, of Ironbridge, who made a microscopical examination and reported as follows: "The tumour consists of spindle cells with large oval nuclei. Whilst it has much the appearance of ordinary spindle-celled sarcoma, there is yet a difference, for in many places there is a fairly developed fibrous tissue, and the blood-vessels are not merely cavities in the tissue of the growth, but have imperfectly developed walls. The portion of the growth nearest to the tissue of the iris shows this more or less fibromatous structure. Towards the free surface of the growth the type becomes more distinctly arcomatous."

The patient recovered quickly from the operation with perfect sight.

Two interesting questions present themselves.

(1) What was the nature of the tumour?

It had all the clinical features of a telangiectasis of the iris, and was thought to be such up to the time of removal.

The microscopical report, on the other hand, speaks strongly in favour of sarcoma.

Both these growths are very rare in the iris, especially the former. Cases of sarcoma have been reported by Lebrun, Dreschfield, B. Carter, D. Little, and others. In most of them the tumour was of rapid growth and melanotic. In the case I report there was very little melanosis, and the growth was very slow indeed.

Little's case was similar to mine in being non-pigmented.

This absence of pigment is very remarkable in a tumour of an organ so pervaded with pigment as the eye; particularly as the tumour occurred in that part of the eye, the iridociliary region, which is, *par excellence*, the pigment-region.

Can the growth in this case have been originally of a cavernous type, taking on later a sarcomatous character?

(2) Is the tumour likely to recur?

Prima facie one would say it almost certainly would, like sarcomas in other parts of the body. But sarcomas of the iris seem happily to keep up their character of being peculiar in this respect also. They not only are not pigmented, though they occur in a region abounding in pigment; they not only grow slowly, but also they do not—at any rate always—recur. In Little's case there was no recurrence, and so far there has been none in mine; and I believe there are other such instances of non-recurrence reported.

It is, of course, much too early to speak absolutely on this point. The case will need careful watching for some years.

APHAKIAL ERYTHROPSIA.

By W. M. Beaumont.

SURGEON TO THE BATH EYE INFIRMARY.

The following case is, I think, of some interest :—

Mary B., æt. 77, had her left lens removed (with iridectomy), in consequence of senile cataract, on July 7, 1889. Her convalescence was slow but uneventful, and she was discharged on August 2. Vision + 11 D. = $\frac{6}{36}$. On August 5, she went out for a short walk, her eyes being protected by blue glasses and a shade. As soon as she got home everything appeared of a red hue ; her pocket handkerchief she thought was covered with blood. The next morning when she awoke the window appeared to be of a red colour —white things especially looked red, and objects around she described as being "fairy-like." She complained also of metamorphopsia, the moon seemed to be oval, the lamps in the street appeared to have "a tail three yards long," and a candle-flame looked larger than natural. When she looked out of the window she saw "tombstones with rounded tops." The redness was always worse by gaslight, and was especially noticeable in church. The urine was normal, containing neither albumin nor sugar. The fundus oculi revealed nothing abnormal, and the tension of the eye was not increased. The iridectomy was small and not quite perpendicular. Gradually the erythropsia subsided, and did not trouble her much in September. In October she had a slight recurrence after being exposed to a strong light out of doors. I lost sight of her after that for two years, when she returned and said that she had had only slight relapses two or three times after exposure to bright sunlight.

The cataract in the right eye was now mature, but the patient was contented with the vision of the left, and refused to allow extraction of the lens. I was particularly

anxious to operate on that eye without iridectomy, not that I look upon the iridectomy as the chief cause of the erythropsia, for cases have been recorded in which no iridectomy had been performed,* but because it would have been interesting to see if such a procedure were accompanied in any modified manner by the recurrence of the erythropsia.

Although ophthalmologists disagree as to whether erythropsia is a central or a retinal lesion, there seems to be no doubt as to the part played in these cases by direct light, as from the sun; by glare such as that reflected from snow; as well as by a condition of nervous exhaustion. In several cases it has been the rising or setting sun that has been the exciting cause of an attack—that is, when the rays would be projected not directly on to the retina. The similarity in respect to the onset in many of the published cases is striking. In Hirschler's case the erythropsia was first noticed on a summer's evening out of doors, and it was also observed when he looked towards the window indoors.† In Dimmer's case the symptoms began in the morning. In Purtscher's, on a bright hot day. In Benson's‡ on a bright sunny day when there was snow on the ground. In Mackenzie's case,§ probably not aphakial, the patient was exposed to the glare of the morning sun at the sea-side. In Berry's case‖ the patient was mountain climbing among snow-peaks and glaciers. In the historical case of Henri IV. of France, he is said (Berry, p. 68, *op. cit.*) to have been playing chess in the garden on an August day. In the case I have recorded, the patient was taking her first walk, after the lens extraction, on an August afternoon.

In most of the cases the erythropsia is intermittent, which would seem to point to a temporary or func-

* By Benson and Dimmer, OPHTH. REV., Vol. II., p. 367.

† OPHTH. REV., Vol. II., p. 278. ‡ OPHTH. REV., Vol. II., p. 361.

§ "Practical Treatise on Diseases of the Eye," 4th Edit., 1854, p. 933.

‖ "Subjective Symptoms in the Eye Diseases," 1886, p. 67.

tional disturbance, rather than to any organic tissue change. It seems possible in aphakial eyes that rays of light would be more diffused on the fundus oculi, and that a greater stimulus than in normal eyes would thus be given to the peripheral parts of the retina. Even where an artificial lens has been supplied it is probable that the focusing on the yellow spot is less perfect than by nature's method. Again, it is probable that the intra-ocular pressure is reduced considerably by the removal of the lens, and the static equilibrium thereby affected. May it be that these two conditions—viz., the more diffused light-stimulus, and the reduced intraocular pressure, cause a vaso-motor dilatation of the retinal vessels sufficient to tinge the percipient faculty, and thus accounts for the subjective sensation of erythropsia? That the ophthalmoscope reveals no apparent alteration in the vessels is true, but Mayerhausen* describes a form of photopsia depending on pressure caused by over-dilated vessels in the retina, which occurs in constitutionally nervous individuals suffering from neurasthenia. In these cases, he says the vessels, through whose over-distension the symptoms are caused, "are probably the outer network of capillaries which are mostly situated in the inner nuclear layer of the retina." As predisposing causes of this state, Mayerhausen gives violent exertion following prolonged use of the eyes, especially at a time when the nervous system is exhausted, as by fasting. In Hilbert's case, he himself being the patient,† the symptoms were unusual, and would seem to point to some circulatory disorder. He noticed, after a sleepless night, that in looking at a white surface the field of vision was subject to a rhythmical brightening and obscuration "occurring synchronously with the pulse beat, the brightening with the systole, the obscuration with the diastole." On another occasion, in walking along the street, the "interspaces between the stones of the pavement, pre-

* Quoted by Berry, *op. cit.*, p. 64. † OPHTH. REV., Vol. IV., p. 44.

sumably the darker portions of the object looked at, appeared red, as though strewn with carmine." It occurred only out of doors, and always disappeared after the mid-day meal.

In cases of slight retinal hæmorrhage objects often appear tinged with a red hue,* and in erythropsia the redness is often spontaneously described as the colour of blood. One of Hirschberg's patients† saw all objects blood-red. Benson makes use of the same expression. My patient thought her handkerchief was covered with blood. Henri IV. thought he saw spots of blood. Berry‡ describes the colour as a vivid blood-red.

In connection with this subject it is interesting to note Sir D. Brewster's explanation of erythropsia in a case of hyoscyamus poisoning, quoted by Middlemore, *Treatise on Diseases of the Eye*, 1835, Vol. II., p. 237:—"The red light," he says, "is probably nothing more than the red phosphorescence produced by the pressure of the blood-vessels on the retina."

* Berry, *op. cit.*, p. 68. † OPHTH. REV., Vol. II., p. 278.

‡ "Diseases of the Eye," 1889, p. 327.

A CASE OF INCOMPLETE ANOPHTHALMOS.

By William George Sym, M.D., F.R.C.S.E.

A small but not very weakly-looking child was brought to me the other day in the hope that "something might be done" to restore sight. On examination I found the condition to be as follows:—

J. K., aged 3½ weeks, weighs 8¼ lbs. Except as regards the head, the child is well formed. There is a bad cleft palate, a wide aperture separating even the uvula into two quite distinct portions; harelip extends to the nostril on the left side. On account of this condition the child is unable to suck, and has, therefore, suffered in nutrition. For a few days he was nourished on his mother's milk given with a spoon; but since that supply failed, recourse has been had to cow's milk.

There are well-marked upper and lower lids on each side with lashes; and apparently the lachrymal apparatus is normal. In the left orbit, on separating the lids, is seen a small cyst or sac about the size of a pea, apparently consisting of scleral tissue entirely covered by conjunctiva, and showing no trace of cornea except that over part of the front portion the colour is bluish, as if due to the more deeply lying pigmented structures shining through. In the lower lid there is a cyst which was tapped and found to contain a thin straw-coloured fluid. The right orbit contains a very small eye, about the size of an average pea, with a circular cornea which measures 3 mm. across, and gives a bluish reflection; an iris with a well-marked coloboma downwards can also be seen in this eye.

It is interesting to note that, considering the very small size of the imperfect globes, the orbits are relatively large. On the left side, where the eye is most imperfect, the height of the orbit is 15 mm., the palpebral aperture measuring 22 mm. On the right side, the height is 12 mm., and the lid aperture 20 mm.

Mrs. K., the mother, has been confined five times, J. K.

being her seventh child. She has twice had twins, a boy and a girl on each occasion; the boys, however, who were the stronger-looking children, have died, while their sisters are alive and well. The six elder children were all perfectly formed (except one boy, who had a high degree of phimosis), and there is no history of any deficiency or mal-development among the relatives of either parent. The parents are, I believe, sober, worthy people. There is no reason to suspect syphilis.

My friend Dr. MacCreadie, of Leith, who attended Mrs. K., tells me that she had very poor health during her last pregnancy, the body and legs being so swollen in the later months that she was unable to go about. In the earlier months she was much overworked. Labour was very severe, but no instruments were needed. The child was at full time. Mrs. K. considers the condition of the child to be due to her overwork, and to her having had a great deal of sewing to do, for which she employed a sewing machine worked by the feet, during the earlier months of her pregnancy. She had received no frights, or been otherwise mentally distressed. I have had the child weighed again, and find it to be now (4 months) 10 lbs.

NOTE ON THE DIRECT APPLICATION OF HOT WATER IN CERTAIN CORNEAL AFFECTIONS.

By J. A. Lippincott, M.D., of Pittsburgh.

In two or three cases of obstinate corneal ulcer and in one case of suppuration of the corneal wound after iridectomy, the writer has obtained excellent results from the repeated instillation of water, at a temperature of about 150° F., applied directly, drop by drop, to the affected area. The first case in which this mode of treatment was tried may be briefly related:—

In March, 1890, Harry E., a handsome, but strumous looking boy of five years, was brought to me with a sore eye, which for two weeks had been steadily getting worse. Separation of the lids revealed a central ulcer of the cornea about 3 mm. in diameter and surrounded by a hazy zone. Pupil small and eye much injected. Pain moderate, but photophobia intense. Solutions of boric acid, borax, atropine, corrosive sublimate, and nitrate of silver, ointment of the yellow mercuric oxide, together with very hot applications to the closed lids, were used either successively, or several of them simultaneously. Internally tonics and alterative remedies were prescribed, *e.g.*, quinine, iron and strychnia, arsenic, cod liver oil and syrup of the iodide of iron. After three weeks the ulcer seemed to be *in statu quo*. The iris was clearly not inflamed, but the pupil remained small, although the boy, a much petted lad, was brought to see me twice daily, and for five to ten minutes lay with his head between my knees with the eyelids widely separated, while a solution of sulphate of atropia, four grains to the ounce, was dropped without stint upon the naked cornea. Puncture was proposed, but the father begged that any operative interference might be deferred to the last moment. It suddenly occurred to me one afternoon to try the virtue of heat. Accordingly, instead of applying the atropine solution warm, as is my habit, especially in children, I held the dropper in the flame of the spirit lamp until its contents reached the boiling point; and then allowing the fluid to cool for a moment, let one drop fall into the ulcerating cavity; the application was repeated in about a minute. Next morning, to my surprise, the patient had his eye open, and, on inspection, the redness was distinctly less, and, most wonderful of all, the pupil was widely dilated. The proceeding of the previous day was repeated then, and also the following day, by which time recovery was so far advanced, and the signs of irritation had disappeared to such a degree, that the parents could manage the case by themselves. In two weeks nothing but a small and rapidly fading scar was visible.

The same method of treatment was applied in a

case of infection of the corneal section following iridectomy. The water in this instance was heated to a temperature of 160° F. in a large test tube, into which a sterilized thermometer had been placed. The dropper used was also kept immersed in the liquid. In transferring the dropper from the tube and making the application, it is probable that from five to ten degrees of heat were lost. Six or eight drops (singly and at intervals of a second or two) were instilled night and morning for three days. The cautery had been applied when the trouble was first discovered; but I am inclined to believe that the hot water treatment aided materially in bringing about a favourable termination.

It may be added that, should anyone else feel disposed to try this method, it would be as well not to heat the water in the dropper, as was done in the first case, but in a test tube or some other vessel, not only to secure a certain temperature, but because the generation of steam or the expansion of the air above the fluid in the dropper is apt to expel the hot water suddenly and inopportunely.

E. SIEMERLING (Berlin). **On Chronic Progressive Paralysis of the Eye-Muscles.** *Archiv für Psychiatrie XXII., Suppl.*

This work is a treatise on the subject of ophthalmophlegia nuclearis. Eight original cases are carefully recorded, and details of the microscopical examination of the central nervous system are given and well illustrated. The portion of the work which it is our intention to review is that devoted to the anatomical consideration of the oculc-motor nucleus and its clinical importance.

Since Gudden in 1881 called attention to the cell grouping of the oculo-motor or third nerve nucleus, many observers have followed in his footsteps. The latest and most detailed examination of this nucleus in man is that given by Perlia (*Graefe's Archiv*, XXXV. iv. *p.* 287). As this has not as yet found its way into text-books, it may not be out of place to briefly refer to it here. He distinguishes as the chief group on either side posterior and anterior dorsal and ventral nuclei. The postero-ventral group of cells passes directly over into the nucleus of the nervus trochlearis. In the oculo-motor nucleus there is also found an unpaired large-celled group (nucleus centralis) and a bilateral small-celled group (the Edinger-Westphal nucleus). In front and laterally to these there are other collections of cells consisting of antero-median and antero-lateral nuclei (antero-lateral nucleus of Darkschewitsch).

Certain functions have been associated with the different cell groups, but it is unnecessary here to refer to the experiments of Hensen and Völckers or the pathological observations of Kahler and Pich on this subject. Mendel made a valuable addition when he pointed out from experimental evidence that the oculo-facial group of muscles (M. frontalis, corrugator supercilii, and orbicularis palpebrarum) was innervated from the posterior part of the oculo-motor nucleus, and Spitzka showed that a bundle of fibres passed from the posterior longitudinal fasciculus to join the emerging facial root. The author also considers carefully the literature upon the difficult subjects of the fibres subserving the pupillary light reflex and for conjugate deviation of the eyes, and he concludes that, in spite of numerous anatomical investigations upon the cell-groups of the oculo-motor nucleus, we are unable to assign individual muscles to definite nuclei, but that in all probability the centre for accommodation and iris movements is in the anterior portion of the nucleus, while that for elevation of the eyes lies in the postero-lateral segment of the oculo-motor group.

The author then proceeds to detail his own observations on this subject. Text-books are generally agreed that the trochlearis and oculo-motor nuclei are directly continuous, and that the place at which the oculo-motor sphere begins

is distinguished by an enlargement of the ganglionic cells. Siemerling inclines to the following view. At the level of the trochlear nucleus, but in the posterior longitudinal bundle, there lies a cell-group which is individual and distinct. This cell-group is separated from the central grey matter by the out-passing trochlear fibres; but when these have passed away (*i.e.*, proximally), it gradually takes up a dorsal position and merges into the oculo-motor nucleus. It does not appear to have any association with the trochlear fibres. In appearance the cells are like those of the oculo-motor nucleus and are distinctly smaller than those of the trochlear nucleus. The number of cells diminishes as it passes into the oculo-motor groups. The special interest in this nucleus seems to lie in its physiological aspects. In several of the cases recorded this nucleus was degenerated, while the trochlear was quite intact. Now it was found that in all the cases (3 out of 8) in which this group of cells was atrophied, ptosis was a prominent symptom; in the remainder the functions of the levator palpebræ were undisturbed. Noteworthy also is the condition of the muscle and nerve fibres of the levator palpebræ. In the cases where no ptosis existed the nerves and muscles were quite healthy, in the others these were much atrophied. In none of the cases is the relation of the oculo-facial group of muscles especially brought out. Further investigation is yet required on this point.

Attention is now given to the remaining cell-groups of this nucleus. According to Perlia, the chief group consists of the ventral and dorsal anterior and posterior nuclei, the Edinger-Westphal group, and the central nucleus. The author prefers the division into an anterior and posterior ventral nucleus, not being able to confirm anterior and posterior divisions of the dorsal group. The Edinger-Westphal group begins quite at the posterior end of the oculo-motor nucleus; about the middle of its course there is an interruption, where it divides into a lateral and a median part. He confirms the position of the antero-lateral nucleus of Darkschewitsch, and the presence of fibres to it from the posterior commissure.

The following, then, is Siemerling's view of the oculo-motor group of nuclei :—

1. The posterior and anterior ventral nuclei.
2. The dorsal nucleus.
3. Median and lateral cell groups, forming the Edinger-Westphal nucleus.
4. The unpaired central nucleus.

The connections of the antero-lateral nucleus of Darkschewitsch are doubtful. Nos. 1, 2 and 4 contain large ganglion cells; No. 3 contains small cells without processes.

The author now considers the clinical and pathological relations of these nuclei. Miscroscopic examination showed that :—

1. The Edinger-Westphal nucleus was quite unaffected in all the cases where it was examined.

2. The antero-lateral nucleus was degenerated in all the cases.

3. The posterior commissure did not present any abnormal features, except in one case, where there were fresh hæmorrhages, but no atrophy of the ventral fibres.

4. The central grey matter was sclerosed, the connective tissue of the nuclei was broken and split up, and stained deeply with carmine, and at the level of the third and fourth nuclei there was a disappearance of the fibres passing from the substantia reticularis to the posterior longitudinal bundles.

The clinical relations are the following :—The pupillary light reaction was destroyed in all the cases; reaction on convergence was preserved in two cases, but was absent in four. An accommodative contraction was not readily made out, but seemed to be present in one case. The single definitely detected pupillary reaction, therefore, was convergence contraction in two cases. These two cases came under the group where the antero-lateral nucleus was degenerated, but in one the atrophy of the cells is stated to be slight, while in the other it was more pronounced. In all Westphal's nucleus is healthy. The writer is therefore inclined to place the centre for the internal eye muscles in the antero-lateral nucleus of Darkschewitsch. His facts do not justify him in stating definitely what are the paths of the pupillary light reflex. Neither can a localisation of the

centres for the external eye muscles be made. The dorsal, ventral, and central nuclei are deeply degenerated, associated with corresponding limitation of the eye movements. Siemerling is unable to support the view of Duval and Laborde that the abducens nucleus contains the centre for the conjugate movements. He accepts the posterior longitudinal bundle as the communicating pathway between the several oculomotor nuclei (3rd, 4th, 6th), but he avoids criticism of the theories whether a decussation occurs in its course from the abducens to the oculo-motor nucleus or where the fibres pass out from this nucleus.

WILLIAM ALDREN TURNER.

F. FUCHS (Vienna). On the Anatomy of Pinguecula. *Von Graefe's Archives, XXXVII., III., p.* 143, 1891.

Having obtained from the mortuary a large number of eyes affected with pterygium in all its stages, Fuchs minutely investigated the tissue changes which occur in this condition, and at the same time made a careful clinical study of its causes and mode of development. He came to the conclusion that a pinguecula is the first stage in the development of a pterygium. The present paper deals with the nature of pinguecula and certain allied changes.

Pinguecula belongs to the group of senile changes in the eye, but its relation to age is more variable than that of most other senile changes. It is often absent in the aged and may sometimes be found in the comparatively young. The fully developed pinguecula is preceded during many years by a local thickening of the conjunctiva which passes unnoticed because there is no discolouration. In a boy of fifteen years suffering from a subconjunctival hæmorrhage in the one eye, Fuchs was able to observe a well marked early stage of pinguecula, the thickened area being rendered visible by the background of blood, while in the other eye, in which it was probably present at thirty, it was invisible.

Pinguecula usually makes its first appearance and reaches its greatest development at the inner side of the cornea; the same is true of pterygium. Both conditions, however, present occasional exceptions to this rule. Pinguecula is of triangular form, the base coinciding with the inner margin of the cornea, and its middle point lying rather below the horizontal meridian of the eye. When of large size and occurring on both sides of the cornea it may extend completely across from the one side to the other below the lower margin of the cornea; it rarely if ever extends along the upper margin.

Its relation to the cornea is identical with that which pterygium commonly presents, and it corresponds with the girdle-opacity (transverse film) of the cornea. In all three conditions the site of the disease corresponds with the aperture between the partly closed lids. When the eyes have to meet wind and rain the lids are instinctively approximated as much as possible without interfering with the sight. The aperture remaining corresponds with the position of the changes here in question, and there can be no doubt that these changes are induced to a certain extent by exposure to bad weather, smoke, dust, etc. In some instances the thickening of the conjunctiva is not limited by the corneal margin but somewhat oversteps this latter; such cases represent the transition from pinguecula to pterygium.

A minute study of many specimens under the microscope revealed well marked changes. In the superficial layers of the conjunctiva there is a deposit of an amorphous hyaline substance, which appears first in the form of minute granules, lying not within the connective tissue cells but on the surface of the fibres. Later these minute granules become aggregated into larger masses, which adhering together form a more or less unbroken layer. These conglomerations constitute the yellow or yellowish grey spots which are visible, even with the naked eye, in a pinguecula. The amorphous substance is less transparent than the conjunctival tissue. It is very resistant to chemical reagents, being altered neither by strong acids nor alkalies, and dissolved neither by ether nor chloroform. Its behaviour

towards chemical and colouring agents corresponds closely with that of hyalin as described by Recklinghausen.

In the masses of hyaline substance are ultimately developed firmer concretions in which further changes appear to occur, transforming the older concretions into something nearly resembling amyloid substance. The concretions here described are similar to those which cause the arcus senilis.

The hyaline degeneration of the connective tissue fibres occurs chiefly in the loose subconjunctival tissue. The fibres enlarge not only in thickness, but also in length, and thereby assume an undulating and even highly convoluted course. In this situation also the concretions already described are ultimately formed. The fibres of the sclera occasionally undergo a similar hyaline degeneration, but here the changes are less marked, and affect only isolated superficial fibres, and especially those whose course is parallel with the corneal margin. The elastic fibres which in the normal condition are scanty in the conjunctiva proper, and much more numerous in the subconjunctival tissue, become hypertrophied in the area of the pinguecula. These also undergo hyaline degeneration, with the ultimate formation of the concretions above described. For the minute description of these histological changes, and for references to the observations of other writers, the reader is referred to the original paper.

With regard to the causes of pinguecula it is clear that senile degeneration is not the only one. Were it so the characteristic changes would appear all round the cornea, as they do in arcus senilis. The locality of the changes points clearly to external influences as the exciting cause, while the senile condition of the tissues is the predisposing cause which renders these external influences effective. In advanced life nutritive activity is lowered, and in the eye itself we have other instances in which a lowering of nutritive activity predisposes the tissues to damage from external causes. The most striking example is the girdle-opacity of the cornea which is met with in eyes the nutrition of which has been lowered by disease, especially by glaucoma and iridocyclitis. Such opacity is occasionally met with in a healthy eye, but in such cases the sufferer is generally of

advanced age. This affection of the cornea, like pinguecula of the conjunctiva, corresponds in position with the lid aperture, and is, unquestionably, the expression of lowered resistance in the tissues, and consequent mischief from external irritation. Together with the calcification often present in the girdle-opacity, there are the hyaline degeneration and concretions which are found in the similarly affected conjunctiva.

P. S.

OTTO SCHIRMER [Königsberg]. Pathology of Central Cataract. *v. Græfe's Archiv. XXXVII.* iv., p. 41.

This paper may be regarded as a further contribution to the study of zonular cataract (*vide* OPHTH. REV., vol. ix., pp. 52 and 230). Schirmer considers that congenital central cataract is not divided by any hard and fast line from the zonular form of cataract, and holds with Knies that the same disturbance of nutrition may, according to the time it acts, produce either one or the other form of opacity. The difficulty in differential diagnosis between the two forms has been pointed out as a clinical fact by Becker, who, indeed, went so far as to assert that a stationary central cataract has not yet been demonstrated.

A detailed account of five cases of central cataract, which were extracted at v. Hippel's clinique, is given, along with a full description of the microscopic appearances.

CASES I. and II.—Both lenses of a woman aged forty-one, showing spherical greyish-white central cataracts of about six inches diameter. The cataract consisted of small round and oval "drops" just as in the cases of zonular cataract (*vide* OPHTH. REV., vol. ix.), and the drops increased in size and decreased in numbers as they advanced from the periphery of the cataract towards their centres ; in this respect also exactly repeating the appearances seen in the zonular

cataracts. The bodies described as "drops" are the same as those formerly described by Schirmer as vacuoles (*loc. cit.*), he being now convinced that their co-efficient of refraction is higher than that of the rest of the lens substance.

Case III.—A boy of six, with well-marked "rachitic" teeth, on whose eye an iridectomy had been performed at an earlier period. The central opacity was here also formed by the same minute "drops," but no definite change in their number in the various regions of the cataract. Outside the central cataract an ordinary zonular cataract was present.

Case IV.—A man of fifty, with nystagmus and microphthalmos, on whose eye iridectomy had been performed at the age of twenty. Lens extracted after preliminary discission. The nucleus exhibited the same appearance as Case III., and the central cataract was surrounded by a zonular cataract, separated from it by a less opaque zone of lens substance.

Case V.—A boy of fourteen, whose eye had been iridectomised at the age of seven in v. Hippel's clinique, for zonular cataract. This eye presented, at the age of fourteen, a double zonular cataract, the inner zone being absolutely opaque and forming a so-called nuclear cataract. After extraction this nucleus was found to be transparent. The opaque zones were formed by the usual "drops," which existed also to a lesser extent in the transparent zones, and least of all in the transparent nucleus.

Summing up the results, we have in Cases I. and II. cataracts which may be defined as absolutely opaque zonular cataracts. They may be regarded as zonular cataracts caused by some disturbance of nutrition which acted with such energy that unusually extensive changes were produced in the nucleus as well as in the external cataractous zones.

In Case V. we have a typical case of double lamellar cataract, the nucleus being microscopically transparent.

In Cases III. and IV. we have clinically central cataracts of typical form, but of different etiology, rickets in Case III., and a congenital anomaly (microphthalmos) in Case IV. being the probable causes of the opacities. In both cases the central cataract was surrounded by a typical zonular cataract.

The anatomical basis of central cataract is so absolutely identical with that of zonular cataract that it is natural to attribute the two lesions to the same cause, and the fact (now well ascertained) that the two forms are found among members of the same family, and even as in Schirmer's cases in one and the same lens, strengthens this hypothesis.

Schirmer's conclusion is that a zonular cataract results from the action of some noxious agent in the nutrition of the lens. This agent produces the minute "drops" in the whole lens then existing, but naturally produces far more in the young growing peripheral fibres than in the older central portion, and thereby the shape and histology of ordinary zonular cataract is fully explained. But in earlier fœtal life the lens is not alone smaller, but also more spherical, and its fibres are probably all equally alive and growing. A noxious agent acting at this earlier period will, therefore, produce a total cataract of a somewhat spherical form, and the subsequent deposition of new transparent cortex will turn the case into one of ordinary central [or, as it is incorrectly termed, nuclear] cataract.

J. B. S.

COUETOUX (Nantes). Kerato-conjunctivitis of Rhino-pharyngeal Origin. *Annales d'Oculistique*, *December*, 1891.

The belief in the nasal origin of affections of the cornea and conjunctiva has never been discredited, but, on the other hand, has never been firmly established on a precise basis; by the classification of the ocular affections having their origin in the rhino-pharynx, an attempt is here made to supply this want of precision.

The author distinguishes two kinds of ocular affection having this origin: the first kind consists of those cases of ulcers of the cornea which resist local treatment of the eye, but yield readily to that of a concurrent ozœna; the belief

is expressed that the ozœna here sets up a general infective process which interferes with the nutrition of the eye.

The particular object of this paper is to establish the existence of a special form of kerato-conjunctival affection, to find out whether its origin is nasal or pharyngeal, and to reconcile it with the somewhat contradictory results of treatment.

Phlyctenular conjunctivitis of all kinds and spring-catarrh, in which there is superficial infection, scanty discharge, and a tendency to pericorneal thickening, with a liability to recurrence at irregular intervals, are the characteristic diseases having a nasal origin; it is in cases of pericorneal hyperplasia that especial stress is laid. These affections have never had a satisfactory explanation hitherto; they have been attributed to the strumous constitution, but they occur just as often in persons of good constitution as in the strumous. Blame has been laid on astigmatism and strain of accommodation, but they are common in childhood when strain from use of the eyes is certainly not greatest; and, besides, they are not cured by removing the power of accommodation.

For a long time the author has successfully treated various kinds of conjunctivitis and keratitis by nasal insufflations and injections, but was never able to dispense with ocular treatment till a comparatively short time ago, when he began to practise free disinfection of the rhino-pharynx in affections of the circumcorneal region; since that time he has often been able to cure such cases without any ocular treatment.

Where there is nasal or pharyngeal inflammation and obstruction preventing the free current of air through the upper part of the pharynx, a condition favourable to the growth of infectious elements is set up, and this may exist without the presence of adenoid vegetations. The object of the treatment is to disinfect this rhino-pharyngeal region by removing vegetations and setting up a free current of air through it, or if there are no vegetations, by sponging it out with nitrate of silver or other disinfectant.

In cases of eye affection of this nature of long duration, where there is much ulceration of the cornea the pharyn-

geal treatment seems to have little effect, and ocular treatment takes again the first place.

No attempt is made to explain any direct transmission of the inflammation from the nose to the eye ; the way of the lachrymal duct is rejected, as it opens into the inferior meatus of the nose away from the centre of disease.

Whether extended adoption of the method of treatment here advocated will result in the confirmation of the author's views as to the dependence of pericorneal inflammation in affections of the pharynx or not it is impossible to say, but such treatment must be expected to have a good influence on the ocular conditions by the improvement in the general health brought about by it.

W. T. HOLMES SPICER.

E. E. MADDOX. Objective Strabismometry. *Archives of Ophthal., January*, 1892.

After reference to and some criticism of several of the methods commonly employed for the measurement of squint, Maddox proposes the following plan as fairly accurate and sufficiently speedy for routine use. The description here given is an almost *verbatim* copy of the original.

On the wall is a horizontal board with a candle in the centre, and marked to the right and left therefrom in metre angles, or degrees, or both, for a distance of one metre. The figures to the right are black, and those to the left red. A string, one metre long, is fixed by one end to the centre of the board. The patient is placed opposite and one metre from the candle, the string being raised to measure the distance and then dropped. First, while the patient is told to look at the candle, the observer places his own head a little lower than the imaginary line from the candle to the patient's squinting eye, but in the same vertical plane with it, so as to look into the said eye from the distance of about

a foot. At once the amount of squint is roughly guessed by the position the neglected image of the candle occupies on the cornea by Hirschberg's principle. The sound eye is then covered to let the squinting one look at the candle; while it does this the position of the corneal image is carefully noted. Now the best eye is again uncovered, and the patient is told to look at the number on the board which has been guessed at as probably being the measure of the squint. If the guess be right, the corneal image will now occupy the same position on the squinting eye that it did when the best eye was covered, and the squinting eye was fixing the flame; should the guess be short of the mark the patient is told to look at the next figure, or the next still, or, should it be over the mark, he is directed to a figure less. The figure settled on gives at once the measure of the squint in its primary deviation. Should it be desired to measure the secondary deviation, it is easily done by covering the fixing eye with the hand so as to turn the squinting eye into a fixing one. The patient is now told to look at the same number, but on the opposite side of the candle, to that which measured the primary deviation. On momentarily uncovering the covered eye the corneal image will be seen in its "fixation position,"* if the secondary squint is equal to the primary. If the squint be of sufficiently high degree, the hand can be so held as to screen the best eye from the figure which is fixed, while not interposing between it and the candle. Either way, the figure which measures the secondary deviation is soon found in the same way as the primary. Of course, some eyes have no central fixation, and then the secondary deviation cannot be measured. For children too young to read, and who must, therefore, stand on a chair, a relative can hold a match-box or other article over each figure that is named.

To test for concomitancy, the patient's head should be rotated 20 deg. or 30 deg. to the right, and then to the left, and the squint be measured in each of these positions. The effect of correcting the refraction can also be ascertained.

* By this is meant the position it occupies on the cornea when the eye is fixing the candle. It is nearly always a little (more or less) to the inner side of the centre of the cornea.

If binocular vision be not restored by the correction, it suffices to place a lens before the fixing eye in a trial frame, and watch the corneal image on the naked squinting eye. To ensure that the lens, if strong, exerts no prismatic effect, it should be well centred, and the patient's head, as well as the eye, be directed to the figure indicated on the board as the measure of the squint. Indeed in every case, except in tests for concomitancy, the head as well as the eye should be directed to this figure; the patient will often do so instinctively, but, if not, he should be told to, for it is better to measure the squint in its usual position with the fixing eye looking straight forwards. The angle can be measured by this method, though with not quite so great accuracy as by the perimeter, from the difficulty of ensuring that the observing eye is in exactly the right position. The string attached to the centre of the board should be stretched to the patient's eyebrow, to give an idea of the right plane; and if greater accuracy is required, a thin wire can be suspended from it, bearing a small weight. The observer's eye can then be held just behind the wire. One eye should be covered by the patient's own hand, while the other looks at that figure which allows the corneal image to appear in the exact centre of the cornea.

J. B. L.

STEVENS (New York). An Apparatus for the Determination of Heterophoria. *Annales d'Oculistique, Jan.*, 1892.

The method described by Stevens, though giving less accurate results than those obtained by the author's phorometer, is more easily and quickly used, and has, moreover, the advantage of indicating at the same time both the lateral and vertical deviation of the eye.

A strong biconvex lens—13 D. is the one mentioned by Stevens—of which only a circular 3 mm. area surrounding the axis is transparent, and a small handle with a clip for

this lens constitute the necessary apparatus. These can be imitated by a lens and stenopaic plate, with a 3 mm. aperture, placed in a trial frame.

When a candle flame 6 metres distant is looked at through this "stenopaic lens," it is seen as a well-defined disc of light.

When this lens is placed before one eye and the other eye uncovered a luminous disc and an image of the candle flame are seen, and the relation which these bear to one another will indicate the kind, and, roughly, the degree, of the latent deviation. In orthophoria the candle flame appears in the centre of the disc, and in the various forms of heterophoria it appears displaced to right or left, upwards or downwards, or obliquely when combined horizontal and vertical deviation is present.

J. B. L.

A. TROUSSEAU (Paris). **Consanguinity in Ocular Pathology.** *Annales d'Oculistique, Jan.*, 1892.

The aim of this article is to controvert the generally accepted views as to the influence of consanguineous marriages in giving rise in the offspring to certain definite ocular diseases, *e.g.*, congenital cataract, retinitis pigmentosa, and albinism. The paper is based on the observations both of the author and other investigators.

Reference is made at the outset to the statistics of G. Darwin (*Journal of the Statistical Society*, 1875), which point to the conclusion that the proportion of deaf mutes and of general debility is not higher in the issue of consanguineous than of non-consanguineous marriages. Again, in the case of maritime populations, where inter-marriage had been practised to a great extent, no deleterious effect on the progeny could be discovered (Voisin, 1865). This has been confirmed by Huth, who has made inquiry into a large

number of cases. A recent investigation on this subject by Dr. Louis Lancry (*La Commune de Fort-Mardick, près Dunkerque*, 1890) has been carried out under the most favourable circumstances, inasmuch as the parish registers were placed at his disposal, and he was aided by inhabitants of long standing. In this way Lancry was able to elicit the details of the family histories more accurately than is usual in a subject where information is generally given with suspicious reluctance. He found that of 260 marriages at Fort-Mardick 63 were consanguineous, *i.e.*, almost a fourth of the whole number, or 24 per cent.; the proportion of such marriages all over France being, according to the official statistics, only 2 per cent. Amongst the issue of these 63 marriages only one case of idiocy, and that of doubtful etiology, was discovered, and not a single instance of blindness or ocular disease.

Fieuzal has examined 21 cases of retinitis pigmentosa with reference to the bearing of consanguinity and heredity on their causation. Out of these 21 cases he finds a history of relationship between the parents in 8 instances, whereas in the remaining 13 there is no such history. He refers to the tendency, which perhaps exists, to magnify the influence of consanguinity by neglecting to pay enough attention to the large number of cases of the disease occurring in children whose parents were not related. The same author has found that in 89 cases of congenital cataract carefully investigated by him there was consanguineous parentage in 15 instances. Ferret has minutely inquired into the antecedents of 5 patients, all of whom had retinitis pigmentosa, but without being able to discover any trace of consanguinity.

Trousseau insists on the importance of careful examination with reference to heredity as a cause of this and other eye affections as opposed to consanguinity, and records several instances, some of them occurring in his own practice, where the former was at first overlooked, but was afterwards found to have a more direct bearing than the latter.

He has investigated 20 cases of congenital cataract with special reference to the point under discussion. In 11

of these neither consanguinity nor heredity played any part; it is worth mentioning that amongst these 11 was an entire family of 5 children, whose parents were perfectly healthy, without a trace of relationship, and whose antecedents in all respects were completely free from taint. Of the 9 remaining cases of congenital cataract 5 had a definite hereditary history of this disease. Relationship between the parents was admitted in 3 instances, but further investigation revealed the fact that in one of these cases the mother, in the second the father, and in the third the grandfather, had all suffered from cataract, occurring in early life, *i.e.*, there was a hereditary tendency to cataract; in the remaining case an accurate history could not be obtained, but the mother was reported to have had bad eyes.

Our author reports 11 cases of retinitis pigmentosa; 4 of these occurred without any evident cause; 5 were distinctly hereditary, and 2, at first attributed to consanguineous marriage, were afterwards found to be due, at least with equal probability, to heredity. In one of these 2 cases a maternal aunt was found by Trousseau to have advanced retinitis pigmentosa, and in the other the father and a paternal uncle were both the subjects of this disease.

Albinism is represented by three cases.

In one there is a distinct history of albinism in the father's brother, although the parents, who are in no way related to each other, have normal eyes. One is of obscure origin, and the remaining case is that of a girl whose parents are cousins, and where, therefore, the influence of consanguinity might be urged. It is noteworthy, however, that the father, who is very delicate, is an albino, while the mother is of dark complexion and in robust health. The girl is the fourth of a family of six, four of whom are dark, while two—the patient and the youngest sister—are albinos.

In the 3 types of disease, therefore, there are in all 6 cases, which at first sight are apparently the result of consanguineous marriage, but on more complete examination can, with a greater likelihood, be traced to direct transmission from the parents, while in a 7th case the information is incomplete.

In conclusion, Trousseau again insists on the importance

of making stricter inquiries than has hitherto been the custom, both as to the direct and collateral antecedents of patients before adopting any theory about the influence of consanguineous marriage in promoting disease.

There are many interesting questions bearing on the subject of heredity in eye diseases which have not yet been worked out, if, indeed, they ever can be, but especially important, perhaps, are the successive morbid transformations due to its influence. Thus Trousseau suggests the possibility of an ametropic parent giving birth to an amblyope, whose child, in its turn, might be the subject of congenital cataract; on the other hand can the effect of heredity be favourably modified by the influence of one healthy parent by conditions of environment, occupation, climate, social life, etc. Our author is clearly of opinion that consanguinity in ocular pathology has been accorded a more important position than it deserves, while to the subject of heredity too little attention has been paid.

N. M. ML.

AN INSTRUMENT FOR THE DETERMINATION OF CONVERGENCE-POWER AND THE POSITION OF REST OF THE EYES.

By M. Straub, Utrecht.

For testing rapidly the latent position of the eyes on distant and near fixation I have recourse to a very simple instrument, consisting of a small oblong mirror (dimensions 16 by 4 cm.) attached to a narrow ribbon furnished with a centimetre-scale. This ribbon is about 1·5 metre in length, and has a flat black ruler fastened to the other end.

The instrument is to be applied as follows:—

A small ink-spot being made on the bridge of the patient's nose, between the eyebrows, he must be seated opposite to the observer, with his back to the window. The observer holds the mirror with the left hand against his own forehead, with its long axis horizontally, so that the patient can look in it. The mirror must be then turned on a horizontal axis, enabling the patient to see the inkspot (on his nose), or in a subsequent order of observation a spire, treetop, part of a house opposite or any other distant object, which has been pointed out to him before taking his seat.

The object of this arrangement is obvious: Whilst the patient is accommodating his eyes to various distances, the investigator is near enough to make the usual test for squint by means of the ruler, held in the right hand, and used alternately to cover the right and the left eye.

Meanwhile the ribbon placed behind the patient's ear measures the distance from the eye to the looking-glass, *i.e.*, half the distance for which the eye is accommodated, if the inkspot is fixed.

K

Ophthal. Review, Vol. XI., No. 126, April, 1892.

Each eye is covered and uncovered frequently. The patient will sometimes keep on converging at first, and only after several coverings and uncoverings the innervation of the covered eye gives way, and the eye enters into what might be termed the relative position of rest.

As a rule I determine the relative position of rest at three distances of convergence: 6 metres or more, 50 centimetres and 30 centimetres. I also note whether in these positions there is convergence or divergence, and also, as far as possible, whether the angle of convergence or divergence be large or small.

The following table gives the result of my experience in 59 cases of abnormal refraction, and 17 cases of emmetropia. In each case binocular vision was tried by Hering's test. All the patients were young adults.

Refraction.	Distance.	Binocular Vision.			No Binocular Vision.			Total.		
		Div.	Conv.	Parall	Div.	Conv.	Parall.	Div.	Conv.	Parall.
H. and H. As.	30 c.m.	5	1*	—	3	6	1	8	7	1
	50 c.m.	4	1*	1	3	6	1	7	7	2
	∞	3	1*	2	1	5	4	4	6	6
My. and My. As.	30 c.m.	12	—	—	2	—	1	14	—	1
	50 c.m.	11	—	1	3	—	—	14	—	1
	∞	5	1	6	2	1	—	7	2	6
Single As. in both eyes.	30 c.m.	5	—	1	1	—	—	6	—	1
	50 c.m.	5	—	1	1	—	—	6	—	1
	∞	2	—	4	1	—	—	3	—	4
E. in one eye, H. or H. As. in the other.	30 c.m.	4	1*	1	—	2	—	4	3	1
	50 c.m.	2	1*	3	—	2	—	2	3	3
	∞	1	1*	2	—	2	—	3	3	2
E. in one eye, My. or My. As. in the other.	30 c.m.	3	—	1	4	—	—	7	—	1
	50 c.m.	3	—	1	4	—	—	7	—	1
	∞	2	1	1	2	—	2	4	1	3
E. in one eye, As. in the other.	30 c.m.	5	—	—	—	—	—	5	—	1
	50 c.m.	5	—	—	—	—	—	5	—	—
	∞	4	—	1	—	—	—	4	—	1
E.	30 c.m.	15	—	2	—	—	—	15	—	2
	50 c.m.	14	—	3	—	—	—	14	—	3
	∞	7	—	9	—	—	—	7	—	9

* Six of 26 answers were false (Hering).

A divergent or parallel position of rest was found the rule in E. and My., a convergent position of rest only an attribute of those cases of H. in which binocular vision is absent. I think this evidence will go far to reconcile Donders' and Stilling's theories of strabismus.

The results of my investigation do not in every point agree with those of others, especially Stilling's. Perhaps the difference may be explained by the fact that in the former investigations the position of rest was observed by the patient, while in mine this was done objectively.

Use in Ophthalmic practice.—The determination of the position of rest at various distances shows that in viewing a near object convergence does not continue unless required, and the covering up of one eye would normally cause relative divergence.

At a distance of 30 or 50 centimetres deviation of the covered eye must occur in a very slight degree; considerable deviation indicates want of convergence power, which is clinically important when binocular vision exists.

Insufficiency of convergence can thus be excluded or diagnosed without difficulty.

It is not my wish, however, to make this test take the place of others. On the contrary, in some instances, I follow up my test by Schiötz's quantitative one, as described in *Archiv fur Augenheilkunde* XX., 1889.*

The first use of the mirror-test is to determine whether a quantitative one should be applied, besides which it controls (objectively) the patient's own statements after examination by the prism or rod test.

Again, the instrument will be found useful for diagnosis of monocular amblyopia, for instance: Cover up the sound eye and make the affected organ fix the ink-spot, spire, etc. Then uncover both, and it will be observed that the sound eye will take over all the work,

* Of Maddox's rod-test I have as yet no personal experience.

whilst the other, which up till now had been exerting itself to see, will deviate as completely as if covered by the hand. Theoretically, this proves that in cases of monocular amblyopia, the affected organ is in the relative position of rest. Practically, this demonstration gives an objective proof of monocular amblyopia. Thus the old definition, viz., that in such instances, neither the patient nor the observer can see anything at all, does not hold good.

Military surgeons having to deal with cases of simulation, will find the experiment just described to be of great use.

Since this paper was written, Dr. Berry's important paper on the same subject appeared in the *Helmholtz Festschrift*. Generally, the results of his quantitative determination agree with my qualitative. My table contains fewer exceptions to the general rule than, I think, Dr. Berry noted.

THE LIGHT STREAK ON THE RETINAL VESSELS.*

By J. B. Story, Dublin.

The vitality of error is a matter of only too common experience, and no more brilliant example of it can be shown than the theory of the cause of the light streak seen on the retinal vessels in ophthalmoscopic examination. The true doctrine has long been before the ophthalmological world, but the old heresy appears to be still in existence if we may judge from the paper published by Davis, which appears in abstract in the *Ophthalmic Review* for 1891, page 88.

* Read before the Section of Anatomy and Physiology of the Royal Academy of Medicine in Ireland.

The history of the subject is briefly as follows: The very earliest observer (Ed. Von Jæger) attributed the light streak to a reflection from the walls of the vessels, though he subsequently (and I think erroneously) modified his theory by assuming that it came from the convex surface of the blood column, the vascular walls being in his opinion too transparent and too similar in refractive power to the retinal tissues to produce the reflex.

This theory of a reflection from the convex cylindrical surface of the blood column, or of the vessel wall, was opposed by Loring in 1871 (*Archives of Ophthalmology*, Vol. II., No. 1, p. 95), who held that the light streak is caused by reflection of light from the illuminated background (*e.g.*, the posterior limiting membrane) transmitted through and refracted by the convex cylinder of the blood column. In fact the blood column acts as a convex cylindrical lens. This is the view that has again been advocated by Davis.

Loring supported his theory by the following arguments. The light streak is too broad to be a reflection from the convexity of the vessel or of the blood column. The blood column is too transparent and non-reflecting to give so brilliant a reflection. If the blood column reflected the light streak the latter would be best marked when the vessel was full, but in venous pulsation it disappears when the vein is distended. (Loring describes venous pulsation as a temporary stasis, during which the crowding together of the blood globules renders the blood column so opaque that light cannot pass through it to produce the light streak.) The state of the background affects the light streak, for it is absent in detachment of the retina. Loring adds the demonstration of an experiment with a glass tube containing carmine solution placed in the bottom of a cylindrical box and illuminated by an ophthalmoscopic mirror. No reflex, he states, can be seen when the bottom of the box is a non-reflecting surface, but a reflex is visible if a mirror be placed beneath the glass tube.

Loring's theory has been submitted to an elaborate refutation by Schneller (*Graefe's Archiv.* XVIII. i. p., 113). Schneller's view is Jæger's original one, that the light streak is an image of the ophthalmoscopic light reflected from the convex wall of the blood vessel. This he proves by an exhaustive mathematical analysis of what the size (*i.e.*, breadth) of the reflection should be, the data being given—viz., the size of flame of lamp, curve of mirror and blood-vessel, and the various distances of lamp from mirror, etc. The facts as observed by him agree with his calculations—as, for instance, the light streak is narrower with short-focus mirrors and in myopic eyes. The reflex moves with the rotation of the mirror. It is almost pure white—not red, as it should be if Loring's theory were correct. It is shortened by backward curves of the vessels. Its absence in detachment of the retina is merely due to want of perpendicularity of the vessel to the line of sight—not to the alteration of the background. Besides, if Loring were right, the refractive index of the blood must be much greater than that of the retina, which we have no reason to believe it to be, and the reflex would not be entirely absent from vessels lying obliquely to the line of sight. The reflex from the veins differs from those in the arteries because the vascular walls are thinner, the vessel is more elliptical in shape and lies deeper, and its walls are rougher and more wrinkled than those of an artery.

Otto Becker (*Graefe's Archiv.*, XVIII. i., p. 281) treats of the same subject, but comes to no definite conclusion. He states that the blood vessels of a frog's mesentery have the power, which Loring assumes for the retinal vessels, of refracting transmitted light.

Jæger (*Ergebnisse der Untersuchung mit dem Augenspiegel*, 1876, p. 51) defends his own view. The reflex cannot come from a tissue beneath the vessel, for it remains unaltered by the background—*e.g.* it is the same whether the vessel passes over the lamina cribroses, the ordinary fundus of a dark or light-haired person, a white exuda-

tion or a dark pigment spot. The vessels cast an intense shadow on the underlying tissues which can easily be observed under certain conditions. The fact that the light streak is not red is enough to disprove Loring's theory. The convex vascular wall, on the other hand cannot cause the light reflex, for the latter disappears, when the vessel is empty, as in embolism. The vessel wall cannot be less transparent than the surrounding tissues, for it is not visible under normal conditions at the sides of the blood column, and for the same reason its refractive index cannot be different from that of the tissues. If the latter were the case, its borders would be marked by dark lines, due to total reflection, and it would distort objects lying beneath. Again, if it were not transparent its shadow would be visible beside that of the blood column when the latter can be observed in subjacent tissues. Now, the light streak can be seen in a vessel right up to the border of the blood column of another vessel crossing above it at right angles. (Jæger allows, however, that a small colourless hardly-visible line can be seen at the edge of the blood column of the upper vessel, more distinctly when the latter is a vein.) Besides, if the vessel wall refracted light the streak on the lower vessel would be seen through the wall of the upper one, when by movements of the head and mirror it was invisible on the rest of the lower vessel.

Jæger illustrates his theory by experiments made with carmine solutions in two glass tubes, one crossing over the other at right angles. When these tubes are immersed in a fluid of the same refractive index as the glass the streak of light reflected from the lower one or rather from its contents, is visible unaltered through the glass wall of the upper tube, and is only arrested by the column of carmine solution in the latter, in fact the light streak behaves precisely as Jæger asserts that the reflex on the retinal vessels does.

Schneller returns to the subject of the light reflex in *v. Graefe's Archiv.* XXVI., p. 71, and upholds his

own view against Jæger's. He asserts that both the arteries and veins of the retina have walls which are visible with the ophthalmoscope at least in the larger vessels. Jæger himself perceived a white line along the border of the vessels which he erroneously thought to be a layer of white blood corpuscles, but the thickness of a white blood corpuscle is too small to be ophthalmoscopically visible, and the white corpuscles do not in any case form a continuous layer along the walls of either veins or arteries. The light yellowish-white line which can be perceived on each side of an artery when the latter crosses over a subjacent vein, and which is about from $\frac{1}{10}$ to $\frac{1}{6}$ the diameter of the blood column, can be nothing else than the optical effect of the arterial wall.

The vascular walls, therefore, are not absolutely transparent, but merely translucent, hiding the underlying objects like faintly muffed glass. The effect observed cannot be due to total reflection, as no dark bordering line is present as can be seen in a dislocated lens, etc. And the smallness of the vascular wall prevents any prismatic effect such as Jæger asserts should be visible, and its translucency prevents its casting a visible shadow on underlying objects.

Schneller rejects Jæger's argument drawn from the disappearance of the light streak when the vessel is empty, as it may just as well be the absence of the cylindrical convexity of the wall which causes the obliteration of the reflex. Jæger's second point, that the refractive index of the vessel wall is too nearly equal to that of the retina, does not affect Schneller's theory that the vascular wall is not a perfectly transparent body.

Jæger subsequently advanced the hypothesis that the refractive index of the blood is actually less than that of the retina. This cannot be the case. The average index of the vitreous is, according to Krause, 1.3485, and that of the retina must be practically the

same. Now, the refractive index of the blood serum is 1·354, according to the observations of Thomas Young in 1801. (It is interesting to find a German in 1880 having recourse of Thomas Young in 1801 for an authoritative statement on a point of physiological optics.)

Schneller has also attempted to estimate the relative luminosity of the light streaks in the veins and arteries, the optic disc, etc. The streak in the arteries (as is well known) is brighter than that in the veins. On Jæger's theory the reverse should be the case (by contrast with the colour of the blood the streak on the vein should appear brighter than that on the artery), and the thicker arterial wall should make the arterial reflex less clear and sharp than that in the vein—whereas the contrary is the fact. Also the venous reflex should not be so irregular as it is, if it came from the blood column, whose surface is perfectly smooth.

All these difficulties are removed if we assume that the reflex comes not from the blood column but from the vessel walls. The smooth arterial wall reflects a sharper image than the more wrinkled venous wall, and as it is thicker its reflex is also brighter. As to the unsoundness of one of the three theories suggested, there can be no hesitation whatever. Loring's theory is demonstrably false, and the experiments to prove it are inconclusive. All that is shown by them is that a cylindrical column of carmine solution has the power of refracting transmitted light—a statement which no one wishes to controvert. Davis has merely shown that a blood column has the same power, which Otto Becker's observations have already decided many years ago. Loring's experiment with the mirror as background for his tube is a peculiarly bad one. The retina does not reflect light like a glass mirror, and what one sees in this experiment is merely the glass tube twice over, viz., the real tube and its nearly equally bright reflection in the mirror—when these two images coincide, of course, the tube seems much brighter, but a light streak re-

sembling that in the retinal vessels is seen just as clearly when the tube passes over a dark background as when it lies on the glass mirror. In any case the tube should not be in air but in some medium with a refractive index nearly equal to that of the glass and its contained fluid—as in the tubes I have the honour to exhibit this evening. It can then be seen that the only reflex at all resembling that in the retinal vessels is the reflex from the anterior wall of the tubes.

Again, Schneller's point that the light reflex moves with the rotation of the mirror is perfectly correct, and is a complete disproof of Loring's theory, as is also the even more incontrovertible fact that the retinal light streak is not red but white. Besides, the absolutely unchanged character of the light streak in the retinal vessels, no matter what the background—white as the optic disc, black as pigment spots, red as subjacent blood vessels—is an easily-observed fact which is quite incompatible with the truth of Loring's theory.

As to the light streak being too broad for it to be a reflection from the convexity of the blood vessels, it must be recollected that the breadth of the reflex should depend upon the size of the actual source of light, and it has been shown by Schneller (whose observations I can corroborate) that it varies directly with the latter magnitude.

Loring's argument upon the behaviour of the light reflex, as observed by him in venous pulsation, proves too much—if the crowding together of the globules in the distended vein destroyed the power of the blood to act like a convex lens, the same would occur in the arteries. But I have not been able to observe the phenomenon described by Loring in any eye, though I have carefully looked for it both in cases of spontaneous venous pulsation and in eyes when I induced venous pulsation by pressure with the finger.

There is more to be said in favour of Jæger's second theory (that the reflex is from the blood column), but I

must, with Schneller, reject it unhesitatingly in favour o his first theory—that the reflex is from the vascular walls.

Jæger's experimental proof is good enough so far as it goes. The reflexes from the glass tubes and from their contents behave precisely as he states they do. But if we assume that the streak on the retinal vessels is caused by a slight opacity or milkiness of their walls, his observations on the glass tubes are not any disproof of the theory at present advocated. Indeed, even if the streaks were caused by the refractive index of the vascular wall being higher than that of the retina, his experimental argument would not be pertinent unless the whole thickness of the vessel wall possessed the high refractive index. If, as is just possible, it was only an extremely thin layer of the vascular wall which had the high refraction, it would be quite possible to observe the light streak on subjacent vessels and other objects through the vascular wall without distortion. But I can corroborate Schneller's observation, that the walls of the larger retinal blood vessels are distinctly visible in ophthalmoscopic examination; in fact, I have never failed to see them when I have looked for them. While in pathological conditions, when they are obvious to all observers ("perivasculitis"), the vascular light reflex is quite as marked a phenomenon as it is in the healthiest retina.

A curious observation can sometimes be made in eyes which exhibit the appearance described as shot-silk retina. The vascular light reflex can be seen as a sort of intensification of the shot-silk retinal reflex—as the light flashes over the fundus it is reflected just in the same way from the vascular walls as it is from the tissue which gives the shot-silk reflex, only that the latter seems on a plane somewhat anterior to the former.

The vascular light reflex can also be seen frequently in vessels situated in an obviously detached retina; and

though it does not affect the argument, I may add that the reflex was distinctly visible in three eyes suffering from that unusual condition, detachment of the choroidea, which I have lately had the opportunity of examining.

OPERATIVE TREATMENT OF INFANTILE ECTROPION.

By Kenneth Scott, M.B., F.R.C.S. Ed.

Ophthalmic Surgeon to Kasr-el-Aini Hospital, Egypt.

Amongst cases of purulent conjunctivitis in infants which have not been properly cared for, instances are not infrequently met with of extreme ectropion of the upper eyelid in one or both eyes. The irritability of the infant, and its frequent crying, greatly aggravates the condition, and prevents all efforts towards a natural cure, by everting the eyelid again when it has been replaced, and by increasing the local congestion and swelling when the eyelid is already everted.

Applying a bandage over the replaced eyelids is useless, as it has to be removed so often to allow of the eyes being bathed, and also it increases the risk of the cornea becoming involved by interfering with the free escape of the purulent discharge.

I have found an efficient but simple method of treatment, and invariably employ it now in all these cases. It consists in replacing the everted eyelid and retaining it in its proper position by the introduction o a wire splint, and is done in the following manner:—

Cleanse the eyebrow and both surfaces of the eyelid thoroughly, and place a spatula under the lid in order to protect the eyeball. Arm a half-curved needle with

a moderately thick silver-wire suture, and pass it from the eyebrow downwards, in the substance of the eyelid, emerging on the free palpebral margin, between the eyelashes and conjunctiva ; enter the needle again on the lid margin at a point about four millimetres distant from the point of emergence, and pass it upwards in the substance of the lid parallel to the first part of the suture, and bring it out on the eyebrow four millimetres from the first point of entrance. No traction should be made on the eyelid now, but it should be seen simply that the piece of silver wire exposed on the edge of the eyelid is closely fitted against it, then fasten the free ends of the suture by twisting them together over a small piece of india-rubber or catgut. Mould the eyelid into its proper shape by bending the silver wire in the lid over the surface of the spatula.

Two sutures may be employed, one towards either extremity of the lid ; but sometimes one suture placed at the centre of the lid proves quite sufficient.

The silver wire should be allowed to remain in the lid for at least six days, and is easily removed by snipping through the exposed piece on the edge of the lid, and then pulling out the twisted ends with forceps.

No dressing is required except a simple dusting with iodoform powder, as the mother or nurse must still continue to bathe the eye and eyelids frequently with an antiseptic lotion.

There is usually a good deal of congestion and swelling following this operative interference, but it soon subsides and is of no material importance. The administration of chloroform is unnecessary, as the small operation can be done very quickly, and is a comparatively painless one. Strong local applications should be discontinued so long as the sutures remain in the lid.

I have employed this method of treatment in nine instances now, and in eight of them with perfect results. In only one case did the ectropion return in any degree

and that was owing to the suture having been removed too soon—on the fourth day—as subsequently a successful result was obtained by the same method of treatment.

After the lapse of a few weeks there is no visible trace of any operative interference having been employed.

A NOTE UPON THE RELATIVE FREQUENCY OF MYOPIA AMONG CHRISTIANS AND JEWS.

By Sydney Stephenson, F.R.C.S. Ed.

In the course of an investigation, which had for its primary object an inquiry into the prevalence and distribution of trachoma and allied conditions, I examined the eyes of the children at the Central Foundation Schools of London. At the time I noted the names of all scholars who were wearing spectacles, and also of those children who complained of not seeing well, or who were reported to me by the teachers as "short-sighted." Further, in all cases of suspected myopia, the near vision was tested by means of Jaeger's hand-types.

For the benefit of readers it may be stated that the Central Foundation Schools consist of two distinct buildings, of which that for the boys lies at some distance from that occupied by the girls. All the pupils are day scholars, and their ages range from seven to seventeen years. Though the upper middle class is to some extent represented, the scholars are chiefly drawn from the lower middle class of society; for instance, the children of tradespeople furnish some 70

per cent. of the total number. From the present standpoint, however, the main interest centres in the fact that a not inconsiderable proportion of Hebrew children are to be found in the schools. Thus, in the boys' school, out of a total of 918 scholars, 116 (12·63 per cent.) are Jews, while, in the girls' school, out of 231 scholars, 72 (31·16 per cent.) are Jewesses.

Nicati, who in 1879 examined the boys' school at Marseilles, where Jews and Christians study together under identical conditions of lighting and follow the same course of instruction, found 15 per cent. of myopia among the Jews as compared with 8 per cent. among the Christians. Again, in the girls' school at Marseilles, Nicati found the Jewesses had 10 per cent. and the Christian girls 7 per cent. of myopia. These figures, which stand, I believe, alone, appear clearly to indicate that members of the Jewish race are more subject to myopia than Christians, and with a view to ascertain whether similar differences exist between the two races in this country, I have worked out the results obtained from my examination of the mixed scholars at the Central Foundation Schools of London.

A word as to the method adopted. In the first place, all children wearing convex glasses have been eliminated. Secondly, I have not included among the ametropic scholars those whose symptoms pointed to hypermetropia. Thirdly, I have left out of consideration all ametropic children who were unable to read No 1 Jaeger when the card was held at a distance selected by themselves. Then, by adding the number of those wearing concave glasses to the number of those with presumptive myopia, a total was reached which represents approximately the number of myopes in the schools. Of course I do not wish to imply that the number of myopes as found in this way is fully representative of the actual number in existence among the scholars ; no doubt many slightly myopic children made no complaint to me, and in the

absence of a distance-test applied indiscriminately to all the scholars I had no means of identifying these cases. But, apart from this, the comparison now instituted between Jews and Christians must hold good in so far that identical conditions of comparison have been applied to both cases. The results may be tabulated as follows:—

TOTALS.	JEWS.		CHRISTIANS.	
	Wearing concave glasses, 5		Wearing concave glasses, 9	
Boys 918	116	14 = 12·06 %	802	15 = 1·87 %
	Presumptive Myopia, 9		Presumptive Myopia, 6	
	Wearing concave glasses, 3		Wearing concave glasses, 2	
Girls 231	72	6 = 8·33 %	159	4 = 2·51 %
	Presumptive Myopia, 3		Presumptive Myopia, 2	
Grand Total 1,149	188	20 = 10·63 %	961	19 = 1·97 %

The table appears to bring into clear relief the following points:—(1) That 10·63 per cent. of the total number of Jews were myopic. (2) That 1·97 of the Christians were myopic. In other words, that myopia was nearly five and a-half times more frequent among the Jews than the Christians. (3) That the percentage frequency of myopia in the Jew boys was more than six times greater than in the Christian boys. (4) That the Jewesses had nearly three and a-half times more myopia than the Christian girls. (5) That the Jews showed a larger percentage of myopes than the Jewesses, the percentage difference between the two classes being 3·63. (6) That the Christian boys had less myopia than the Christian girls, and that the percentage difference between the two classes amounted only to 0·64.

The above figures, deduced from Jews and Christians of much the same social class, studying under identical external conditions, and pursuing the same curricula, are I submit, not altogether without value as confirmatory of the current opinion that Jews are more subject to myopia than Christians.

SIMEON SNELL (Sheffield). **Miners' Nystagmus, and its Relation to Position at Work and the Manner of Illumination.** *Bristol: John Wright. London : Simpkin & Marshall,* 1892.

The author's interest in the subject of miner's nystagmus dates from 1875, in which year he pointed out its apparent connection with certain attitudes which the miner's work obliges him to assume. The present volume sets forth the results of a long investigation which he has carried on since that time, and in the course of which he has not only obtained the assistance of mine inspectors, colliery officials, and many colliers, but has himself been down the pits in order to see the men at their work. It will be convenient to briefly review the various observations and facts which the author has made and collected, and then to discuss the inferences which he draws from them concerning the causes of the disorder.

Years ago the ventilation of coal mines was commonly very imperfect, and the air which the miner had to breathe was impure. At the present time the ventilation is usually good, and the general conditions are apparently as favourable to health as are those which surround other kinds of manual labour, at any rate in towns. The death-rate among miners is not excessively high, even when cases of fatal accident are included; apart from these, it is exceptionally low, being almost exactly the same as that among agricultural labourers. There is, therefore, no evidence to support the opinion once commonly held that miner's nystagmus is caused by dele-

terious gas, impurity of air, or other conditions injurious to the general health of the miner.

The light given by the original Davy lamp was poor, being less than one fifth of that of the standard candle. As the result of successive improvements, and many comparisons of different forms of lamp, several are now in use which give a very much better light. The Marsaut safety lamp, for example, which is largely employed in the mines of the midland counties, gives a light equal to about two-thirds of that of the standard candle. The best lamp, however, is still inferior in illuminating power to the naked light of the tallow candle, which is the usual alternative for the safety lamp. Although the improved lamp, as a miner expressed it, "is daylight to the old one" the candle is still commonly preferred, and among miners the lamp has commonly been blamed as the cause of the nystagmus.

It has been asserted that nystagmus is more frequent now than formerly, but there appear to be no statistics to support the statement. It must be remembered that the number of persons employed underground has greatly increased of late years; thus in 1879 it was roughly 385,000; in 1890, 506,000. Moreover, attention has of late been specially directed to this disorder, and surgeons practising in colliery districts have been more on the look out for it than they formerly were. Thus the author tells us that certain friends of his, who formerly believed that it never occurred among the men who worked with naked lights, have now met with cases among such. It remains an open question whether the disorder is increasing or decreasing in frequency at the present time.

It has been frequently alleged that men suffering from nystagmus improve when they leave a pit where safety lamps are used, and enter one which is worked by naked lights. In every case of this kind which he could investigate, the author ascertained that the miner had changed, not only the kind of light, but the kind of work also. Moreover, well-observed cases are given, in which the disorder became worse, or was not benefited, after the sufferers had obtained work in candle-lighted pits; and also of cases of nystagmus in men who had never worked with protected

lights. No case therefore can be accepted as proving an improvement through better illumination, unless there is distinct evidence that the work was of the same kind as that previously done with the safety lamp.

About two-thirds of the men working in a colliery are engaged in actual coal getting; the others are labourers and haulyers. The nystagmus is almost completely confined to those who hew the coal. On this point there is agreement between those who are best entitled to speak—viz., the author, Tatham Thompson, Jeaffreson, Nieden, and Dransart. The author was the first to declare that among the coal getters, it is those who do the particular kind of work called "Holing" who are especially liable to get nystagmus. Holing is the undercutting of a seam of coal preparatory to getting it down. It is done, the author explains, in several ways, differing somewhat from each other, but in every case the miner has frequently to get partly into the hole he makes, and to work there lying on his side, and looking more or less obliquely upwards. In cutting or driving headings, on the other hand, the miner either kneels or stands, according to the thickness of the seam, with his head straight, and the pick swinging in a vertical line. The proportion of men who hole varies considerably in different mines. In some mines, there are men who do nothing but hole; and others who only do certain other parts of the work; in others each man may be required to hole, detach, fill, timber up, &c. for himself. A fair estimate, perhaps, is that rather less than a third of the coal-getters are more or less occupied as holers.

The author gives details of 127 cases of miners' nystagmus. Of the 127 men, 119 were coal-getters engaged more or less in holing; three were "fillers." The filler fills the corves or tubs with coal, but he is also the embryo coal-getter; he is frequently required to lend a hand in getting, and is very willing to do so. The author took the trouble to ascertain the facts in these three cases, and found that each of the so-called fillers was daily engaged to a certain extent in holing. The remaining five cases were exceptional. Two of the five men were "deputies." The deputy enters the pit before the colliers go to work, and examines the workings

for the presence of gas. A thorough examination of these two men with regard to the nature of their work, and the positions assumed showed that they were accustomed to examine the roof of the pit continuously for hours together, with the head inclined to one side and the eyes directed obliquely upwards. The resumption of this position long after the work had been abandoned re-excited the oscillation of the eyes. Two more of the men worked at "on-setting," that is, taking off the empty tubs and putting on full ones at the bottom of the pit, giving signals to the surface, and superintending the arrival and despatch of men in or from the mine. During such work the head and eyes are frequently turned on one side, so as to watch the descending or ascending cage. Both these men worked in a good light. The fifth exception was that of an "engineman" at the bottom of the pit. He had never been a coal getter. He had, however, to attend to the pipes, and for this purpose to lie on his side and to turn his head much in the same way as the miner does in holing. By the author's advice he abandoned this work, but still went frequently into the pit, and used a safety lamp. He no longer worked in the former constrained position, and recovered perfectly from the nystagmus.

Other forms of involuntary muscular action are met with in association with miners' nystagmus; for example, quivering of the eye-lids, tremors and oscillations of the head, spasmodic torticollis, shaking and other involuntary movements of the arm and hand. The nature of these movements connects them very definitely with the constrained and cramped positions in which the miner works.

Nystagmus is occasionally met with in connection with other occupations which involve an excessive strain of the ocular muscles. Thus the author met with vertical nystagmus in a compositor, whose work, in connection with a daily paper, occupied him from 7 p.m. to 3 a.m. A visit to this man when at work showed that, in looking up from the composing-stick to the copy, he habitually turned his eyes upwards without raising his head, whereas most compositors raise the head simultaneously with the eyes. He was advised to correct this habit, and after so doing he recovered

from the nystagmus and pursued his work with comfort. It is particularly noteworthy, however, that he afterwards became incapacitated through compositor's cramp. Another case is mentioned of pain and exhaustion in the elevator muscles brought on by looking upwards at a tray carried upon the head. Those who decorate and paint ceilings might be expected to suffer from fatigue of the ocular muscles and ultimately from nystagmus, but the author's inquiries showed that these men work with the head thrown back and without oblique rotation of the eyes; they are apt to feel fatigue in the muscles of the neck rather than in those of the eyes.

Nystagmus is almost unknown among Cornish miners, except in such as may have acquired it whilst working in coal mines in other parts of the country. This matter also was investigated by the author during a visit to Cornwall, undertaken for the purpose. The metal mines of this district are worked with candles. The illumination, he tells us, does not differ greatly from that of a coal mine, except that the walls are less black. The positions assumed by the miners are, on the other hand, very different. The men stand upright. There is no need for horizontal pick-work or any other work resembling the holing which the coal miner has to do.

These are, very briefly stated, the principal observations concerning miners' nystagmus, which, at the cost of much labour the author has brought together. It seems ungrateful to find fault with a work of so much value, but we may say in passing, that the book would have been none the less valuable if written in a more condensed style, with more deliberation as to sequence, and, as a consequence, with less repetition. It is, however, exceedingly good as it stands, and is made additionally interesting by a number of excellent illustrations.

The facts now before us have led the author to a very positive conclusion as to the essential cause of miners' nystagmus. He attributes the affection to the excessive action of the ocular muscles, which is demanded by the constrained position in which the miner works, especially when holing. He admits that, all other things being equal,

nystagmus is likely to be more frequent in badly-lighted than in well lighted pits, but he regards an insufficiency of light as a factor of subordinate importance. In the statement of this conclusion, Snell appears to us to lay stress somewhat unduly upon the condition of the muscles. He says, " I have seen nothing to lead to a supposition that the affection is dependent on central disease." Again—" chronic fatigue in the ocular muscles is brought about, and atony being induced, oscillation of the globes is caused." He speaks of the " condition of the muscles" known as auctioneer's spasm, writers' cramp, etc. Now, it is of course impossible to separate muscular fatigue from fatigue of nerve centres. Stephen Mackenzie pointed this out when the subject was under discussion some years ago by the opthalmological society (O.R. vol. 3, p. 284). Hughlings Jackson, speaking of writers' cramp and allied disorders of movement, points out that in such conditions there is loss of some of the most special movements, represented in some of the lowest centres, through atrophy of their cells consequent on over use ; and that, as a consequence of this partial paralysis, there is greater energising of other centres and over development of more general movements (Croonian Lectures, see *British Medical Journal*, April, 1884.) In the case of nystagmus, the symmetry of movement in the two eyes points with especial clearness to a disordered action in the co-ordinating centres, and it can hardly be doubted that in many cases there is permanent structural change in these centres. No doubt the author would agree in this, but we miss any clear reference to the central changes.

Snell refers to the fact that persons whose nystagmus has arisen through the want of good retinal pictures in infancy, do not complain of apparent movements in the objects looked at, while miners are much troubled in this way, and he appears to regard this as an essential and unexplained difference. But surely the explanation is simple. The nystagmic child has learned from the beginning to associate motionless objects, so far as they are visible to him, with an oscillating retina, while the miner has learned the normal association ; the difference in the subjective result is quite analogous with the absence and presence of diplopia

in cases of ordinary strabismus and of recent paralytic deviation respectively.

One more criticism, and a more important one, remains to be made. The opinions which Snell has advanced with such cogency, and in support of which he has collected so much evidence, have been directly contravened by other observers, and with an array of statistics which at least demand attention. Dr. J. Court, of Staveley, lately took up, in what appears to have been a thorough way, the question of the relative importance of attitude and illumination in the production of nystagmus.

He examined 524 men who worked with safety lamps, and 573 men who worked with naked lights. The results are tabulated in his pamphlet in succinct fashion, and would appear to show that the illumination is by far the more important factor in the causation of nystagmus, while his observations in regard to holing are widely discrepant from those of our author. In such a matter it is, of course, extremely easy to be misled by figures, and we do not pretend to say where the balance of truth is; we merely point out that Dr. Court's statistics—to say nothing of some other original papers, advancing objections to Snell's position—might well have been referred to in the work before us.

The physiological reasons for supposing that the absence of a normal stimulus to fixation tends, in the coal miner as in certain other persons, to induce nystagmus, are, in our opinion, extremely strong. They were stated, by more than one speaker in the discussion already referred to (Trans. Ophth. Soc. Vol. iv. p. 327, &c.), and again later, by Tatham Thompson (the same, Vol. xi., p. 95). Retinal fixation, learned in infancy by constant practice, becomes largely an automatic or reflex action. It is facilitated by strong and well-defined retinal stimulus; in the presence of such stimulus the avoidance of fixation requires an effort of the will. Conversely there can be no doubt that the withdrawal of such stimulus weakens the fixation-impulse. This, however, is no denial of Snell's conclusion that the constrained attitude of the holer is a highly important factor The one cause does not exclude the other, and it appears. unreasonable to minimise the importance of either. The

usual cause of nystagmus appears to be *the continued effort to fix, under conditions which render continued fixation peculiarly difficult*, and we see no reason why this definition should not be accepted by both parties to the discussion. The relative importance of the different factors must remain a matter for careful enquiry in individual cases.

Snell reports several cases which justify the hope that many of the sufferers from this distressing condition may be cured by merely effecting a change in their mode of work, without condemning them to abandon their employment as coal-getters. Concerning this matter and other points connected with the prevention and treatment of miners' nystagmus, valuable information is to be found in the present work. We strongly recommend it to all those who are responsible for the welfare of the many thousands of men who work in our coal mines.

BULL (Paris). The Relation between Irregular Contraction of the Ciliary Muscle and Astigmatism. *Ann. d'Oculistique. Feb.*, 1892.

Twenty-three years ago Dobrowolsky published his article on the influence of the accommodation on astigmatism; following him Landesberg and Martin wrote on the same subject; the author here makes a critical examination of the facts which these observers brought forward in support of their views.

Dobrowolsky examined his cases with the stenopaic slit under atropine at first, and then, after recovery from atropine; in certain cases he found astigmatism in the first examination, but none in the second, from which he concluded that the astigmatism had been neutralized by an effort of accommodation; but, as the author points out, in using as lit, rays of light pass into the eye in one meridian only,

and to affect these rays it is not necessary to assume the existence of a partial action of the lens.

Convex cylindrical glasses produce diffusion circles at right angles to their axes, when used for the far point of vision, and parallel to their axes, when used for the near point; the effect of concave cylindrical glasses is exactly opposite. The effect of half closing the lids is the same as that of using a slit held horizontally before the eye, it causes the vertical diffusion circles to disappear, but does not affect the horizontal ones. If artificial astigmatism be produced by placing cylinders before the eye, in such a way that the diffusion circles are vertical, then the half closed lids are able to give clear vision by cutting off the diffusion circles, a result which Dobrowolsky said was brought about by the accommodation.

The author uses tests for astigmatism, placed at the far point or a little beyond it; he slightly under-corrects myopia, or over-corrects hypermetropia, and adds cylindrical glasses until the proper amount of astigmatism is found by the dial. By testing in this way the author finds that subjective regular astigmatism found without atropine does not differ from that found with atropine; he has therefore ceased to use atropine in testing for astigmatism.

The author next criticises the observations of Landesberg, who gives weak concave spherical glasses before testing for astigmatism; the effect of this is to cause spasm of the accommodation, which takes away the value of the patient's answers.

In certain cases, where the ophthalmometer has been used, it has been noticed that the patient refused the glass indicated by the amount of corneal astigmatism, and the observers have felt bound to accept the theory of Dobrowolsky—that the difference between the subjective and objective examinations was due to a dynamic astigmatism of the lens, brought about by irregular contraction of the ciliary muscle. Martin upheld the view that the corneal astigmatism was the whole astigmatism, and that all differences between the subjective and objective tests was owing to irregular contraction of the ciliary muscle; these differences can be seen, however, in all eyes, with or without the action of the ciliary muscle, and even in eyes under atropine.

In opposition to Martin, the author always finds a difference between the corneal and the subjective astigmatism, a difference varying from 0·25D. to 0·75D, rarely more or less; in direct astigmatism, the difference is negative, that is to say, the subjective is weaker than the corneal astigmatism, while the difference is positive in inverse astigmatism. Tscherning has found that, in eyes examined by the electric light, the lens is always placed sufficiently obliquely to produce an inverse astigmatism of from 0·25 to 0·60D.

These observations have suggested to the author the hypothesis that as a general rule the lens is placed somewhat obliquely in the eye, producing slight static inverse astigmatism. In the whole of his experience the author has not found a single fact which would induce him to believe in the existence of a partial contraction of the ciliary muscle.

W. T. HOLMES SPICER.

BROWNING. (Brooklyn, N.Y.) Inequality of the Pupils in Epileptics, with a note on Latent Anisocoria. *The Journal of Nervous and Mental Disease, Jan.*, 1892.

Inequality of the pupils is not very uncommon in person in average health; its occasional occurrence in epilepsy has long been known, and by some authors it has been looked upon as of value in the diagnosis of the nocturnal form.

In 150 consecutive cases of epilepsy observed by Browning, anisocoria was noted in 16, of which number 12 were males and 4 females (of the 150, there were 84 males, 66 females). Only 3 of the 16 were more than 22 years old; of the whole number $\frac{3}{8}$ were over that age.

Schleick in 127 hospital epileptics found only one case of decided anisocoria; Marie noted it in 15% of 53 cases, and Musso in 23% of 70 cases; Oliver, speaking of 50 male insane epileptics, described the pupils as equal in size. These

different opinions may be due partly to closeness as well as time of observation. The age of the patients may have some influence, and the condition of anisocoria seems to be rather more frequent and more marked directly after an attack.

Browning makes three distinct types: (1) cases with very considerable inequality; this form, probably the only one noted by many observers, occurred in 3 cases, all of which were epileptics with decided unilateral symptoms, and thus this marked inequality depended upon localised intracranial trouble. (2) cases of slight but fairly constant inequality; of this form there were 10 examples. The condition might be classed among the exhaustion signs which follow seizures but for its persistence when once present. (3) Latent anisocoria—distinct inequality only in faint illumination. This condition the author has also seen in various non-epileptic cases, and as a plausible explanation suggests that, "whilst the passive (*i.e.*, sympathetic) innervation of the pupils is in such cases unequal or disproportionate, the reflex impulse—equal for the two eyes—is, when fully called into play, quantitively so far in excess as completely to overcome all passive ones, and so for the time being control the pupillary condition." In other words, the condition is supposed to become manifest only when the action of the oculo-motor nerve is relatively or absolutely in abeyance.

The author concludes from his own and other observers' results that, on an average, one in every five or six epileptics will, if examined with care, prove to have some, though only slight, inequality of the pupils.

J. B. L.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, MARCH 10TH, 1892.

HENRY POWER, F.R.C.S., President, in the chair.

The Minute Anatomy of Pyramidal Cataract.—Mr. Treacher Collins read a paper based upon the microscopical examination of six eyeballs. The cases formed a series in

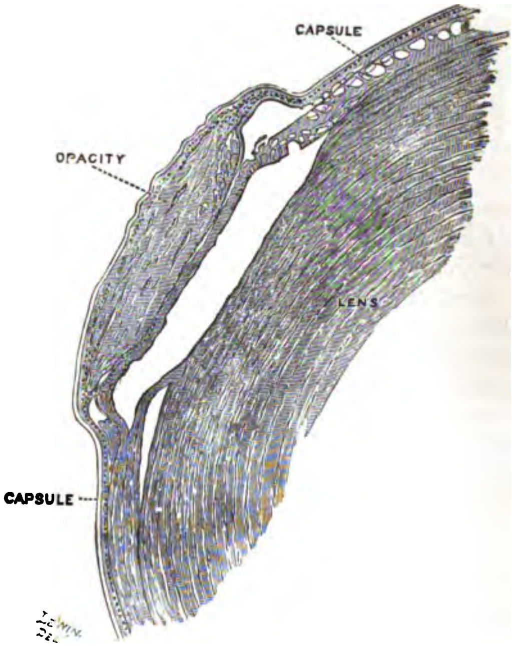


Fig. 1.—Pyramidal cataract of about 6 months' formation. A layer of cells continuous with those lining the capsule elsewhere separates the opacity from the lens substance.

which the interval between the formation of the cataract and the excision of the eye varied from six weeks to twenty-one years. The earliest changes consisted of a localised dis-

turbance and proliferation of the epithelial cells which line the hyaline capsule at the anterior pole of the lens, and consequently some elevation of the capsule. The lens fibres immediately beneath these proliferated cells underwent partial destruction, resulting in a shallow excavation of the lens substance at this point. Pyramidal cataracts of longer duration were found to have a layer of cells between the opaque part and the subjacent unaltered lens substance. These were continuous with, and apparently derived from, the cells lining the anterior capsule elsewhere. In

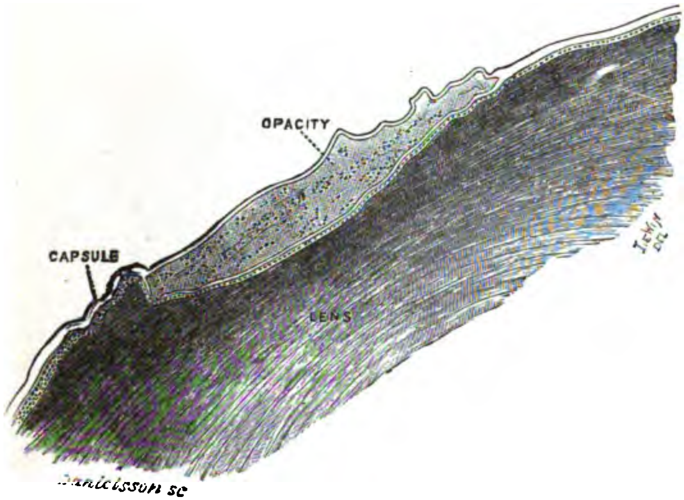


Fig. 2.—Pyramidal cataract of 11 years' formation. A complete layer of hyaline capsule covers the opacity; a similar hyaline layer, lined by cells, passes between the opacity and the lens substance.

two cases of some years' duration there was, between the opacity and the lens substance, in addition to the layer of cells, a layer of hyaline capsule, presumably secreted by the cells. Mr. Collins thought these observations helped to explain the readiness with which the pyramidal opaque portions sometimes became detached on being touched with a needle; for such a touch only completed a separation which had already been partially effected by natural means. He con-

sidered that they also threw some light on the development of the lens capsule; for if the epithelial cells lining it were capable, on the application of a morbid stimulus, of secreting a hyaline layer identical in all respects with it, the inference that the capsule was originally formed by such a secretion seemed a reasonable one. Mr. Collins challenged the statement which had been made, "that in the majority of cases pyramidal cataract was found associated with a perfectly transparent cornea." This, he thought, could only be proved or disproved by the pathological examination of a

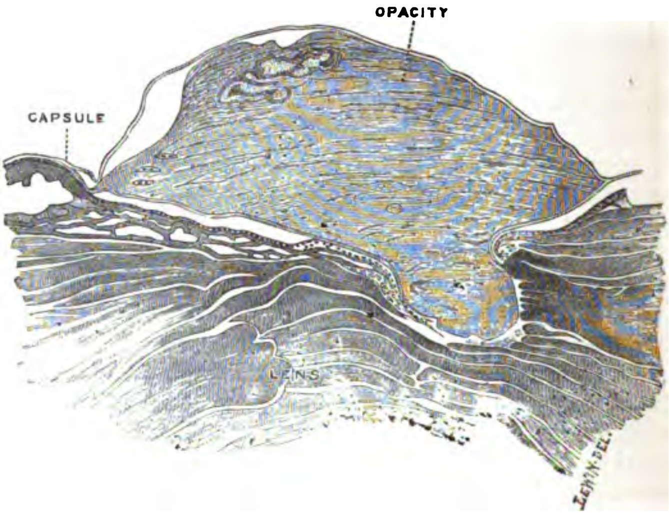


Fig. 3.—Pyramidal cataract of 21 years' formation. A layer of hyaline capsule in front of the opacity; a similar layer of equal thickness lined by cells, behind it.

large number of eyes with opaque corneæ, and he questioned if this had been done by those responsible for the above assertion. In his six cases the cornea was the seat of old or commencing opacity. The paper was illustrated by lantern slides made from photomicrographs.

Mr. Tweedy spoke of the rarity with which opportunities occurred for the microscopical examination of pyramidal cataract. He showed a sketch he had made many years ago of the appearances of the lens capsule in a case in which

perforation of the cornea and escape of the lens occurred during ophthalmia neonatorum. He was of opinion that inflammatory material was first deposited *on* the lens capsule, and set up an intracapsular cell proliferation. He demurred to Mr. Collins's view that the lens capsule was entirely produced by the cells lining it, and thought that its origin was partly epiblastic, partly mesoblastic. He had only once seen a case of pyramidal cataract, with perfectly clear corneæ.

Mr. Nettleship had on one occasion examined sections of a lens with pyramidal cataract, and found that the capsule passed in front of the opacity. He was unable to say if the capsule was split into two layers, as in some of Mr. Collins's specimens.

Mr. Collins, in reply, said that he would divide cases of opacity at the anterior pole of the lens into several groups, and to only one of these could the term pyramidal cataract be properly applied. He maintained that the structure of the lens capsule and the character of the diseases which affected it were evidence of its epiblastic origin.

The Physical Factor in Conical Cornea.—Mr. Tweedy presented this communication to the Society, in extension of some remarks he had made at the previous meeting. He said that several hypotheses had been brought forward in explanation of the cause of this curious disease; these were (1) increased intraocular pressure, (2) malnutrition and atrophy of the central part of the cornea, (3) diminished resistance power, (4) an inherent weakness of the corneal structure. He thought the last hypothesis was most in conformity with observed facts, and this inherent weakness he considered was best explained by imperfect completion of the developmental processes. In early fœtal life the gap in the embryonic cornea, caused by the involution which gave origin to the lens, was filled up by cells, beneath which was a homogeneous layer. Into this layer an intrusion of mesoblastic tissue took place, and, extending centripetally, gradually closed over the central part, which was, however, the last part to be formed. This mesoblastic tissue was the fœtal cornea, and the physical factor of conical cornea consisted in imperfect growth of the central portion of this layer. No other explanation, he thought, would account for

the conical shape assumed by the cornea when thus diseased.

The President asked if Mr. Tweedy's hypothesis would explain the onset of keratoconus in adult life.

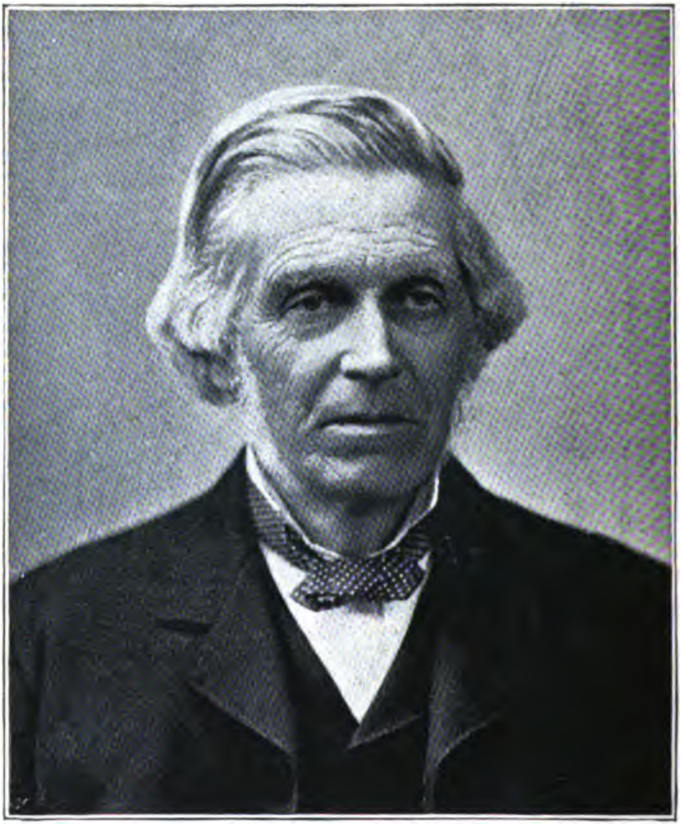
Mr. Brailey mentioned that he had once made a microscopic examination of a portion of conical cornea removed by operation, and found a small cavity just beneath the epithelial layer. He referred to the fact that conical cornea in some cases developed for a time, then appeared to become stationary, and subsequently underwent rapid increase.

In reply, Mr. Tweedy said he did not wish to exclude the agency of other factors in the causation of conical cornea, but merely to draw attention to what he thought was the true physical factor.

Living and Card Specimens. Dr. Rockliffe (Hull): Case of Unilateral Proptosis.—Mr. Hartridge: Case of Double Lacrymal Fistula, probably congenital.—Mr. Work Dodd: Scleroderma of Lower Eyelid and Cheek.—Dr. D. J. Wood: (1), Disease of Retina and Choroid with detachment of Retina; (2), Double Congenital Coloboma in Fundus.—Mr. Tay: Bleaching of Eyelashes and Eyebrows in Sympathetic Irido-cyclitis. Mr. Lawford: Reversible Spectacle-frame.—Mr. Holmes Spicer: Keloid in Scars of Herpes Ophthalmicus.—Mr. Wray: New Vascular Growth in Vitreous.

ERRATA.

P. 73, line 15 from top, for "not directly" read "most directly."
P. 86, line 6 from bottom, for "inches" read "millimetres."
P. 91, line 2 from top, for "neglected" read "reflected."
P. 92, line 12 from top, for "The angle" read "The angle α."



SIR WILLIAM BOWMAN, Bart., F.R.S., LL.D.

(*From a Photograph by Fall*).

SIR WILLIAM BOWMAN, BART., F.R.S, LL.D.

The great surgeon, who throughout the brightest period which ophthalmology has yet known was its acknowledged leader in this country, is gone from among us. Sir William Bowman died, after a short illness, on March 29th, at the age of 76 years, and has left a blank which, for those who knew him in the days of his activity, can never be filled. The history of his professional life and its achievements has already been told by more than one writer who knew him well.* Here we can only sketch it in the briefest manner. It is rather of his example and influence, and of the personal recollections which remain with his many pupils, followers, and friends, that we would attempt to say a few words.

William Bowman was born at Nantwich on July 20th, 1816, being the son of John Eddowes Bowman, a banker and a well-known naturalist. He received the chief part of his schooling and his early surgical training in Birmingham. In the library of a well-known Birmingham citizen there still stands a cardboard model of their school, which was made by Bowman and himself when they were boys together at the once famous Hazlewood—a school kept by Thomas Wright Hill, the father of Sir Rowland Hill and the grandfather of Berkeley Hill.

On leaving school he was apprenticed, at his own desire, and according to the custom of that time, to the eminent surgeon Joseph Hodgson, and under his tutelage entered the Birmingham General Hospital. Here he gave much attention to pathology as well as

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* See *Lancet* and *British Medical Journal* of April 2, 1892.

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to practical surgery, diligently following all the post-mortem examinations, and making detailed records and drawings of the conditions found. His first microscope was given to him at this time by Dr. Blackiston, for whom he had made a large number of measurements of the cardiac orifices. A complete series of his early note-books and pathological drawings was shown by him only a year or two since to an American friend who was visiting him at his country house. It was this habit of minute investigation and accurate record, in conjunction with great natural ability, which raised him a few years later to scientific fame.

In October, 1837, Bowman entered the Medical Department of King's College, London. Two years later he obtained the membership of the Royal College of Surgeons, and was appointed Demonstrator of Anatomy at King's College, being the junior colleague of John Simon in that post. He also became the curator of the museum and the assistant of Todd, the Professor of Physiology, and made most zealous use of these opportunities for original physiological research. Classical contributions to science appeared before long from his pen. During the years 1840 to 1842 he published his papers on the minute structure and movements of voluntary muscle, on the minute anatomy of fatty degeneration of the liver, and on the structure and use of the malpighian bodies of the kidneys.. In 1841, being at that time 25 years of age, he was elected a Fellow of the Royal Society, and in the following year was awarded the high honour of one of the Royal medals for the last of the three papers just named. This, too, was the year of his marriage. About this time, also, he was engaged on the large work on "The Physiological Anatomy and Physiology of Man," which appeared in four serial parts under the joint authorship of Todd and Bowman. In 1844 he became a Fellow of the Royal College of Surgeons.

Up to this time Bowman had given no special atten-

tion to ophthalmic surgery. He had held for several years the post of assistant surgeon to King's College Hospital, and would no doubt have become eminent in general rather than in special surgery had not the force of circumstances and the advice of his professional friends led him, apparently somewhat against his own inclination, to take up the study of diseases of the eye. In 1846, some little while after the retirement of Dalrymple, he was appointed assistant surgeon to the Royal London Ophthalmic Hospital. His paper describing the anatomy of the ciliary muscle appeared in the following year, and soon afterwards his well-known lectures on the parts concerned in the operations on the eye, etc. In 1851 he became full surgeon to the hospital.

Bowman's adoption of special practice brought great benefits to British ophthalmology and great rewards to himself. Well known already as an original investigator and an accomplished surgeon, enthusiastic in his work, and possessing exceptionally delicate manipulative skill, he was in a position to rapidly gain, as an oculist, the confidence and support of the profession. His career began, too, at the most fortunate time. The year 1851, which saw him installed as surgeon to the Moorfields Hospital, was rendered memorable for all time by Helmholtz's discovery of the ophthalmoscope, and during this same year two other men who were soon to render brilliant services to our art and lasting benefits to humanity—Von Graefe and Donders—visited England, met for the first time at Moorfields, and together spent much time with Bowman, both at the hospital and at his own house. Then was formed between these three the warm friendship which, cut short in the case of Graefe by his early death in 1870, lasted unimpaired between the two others for nearly forty years, until the death of Donders in 1889. A certain feeling of romance mingles with the thought of that meeting of the three great leaders

at the moment when a new and fascinating field for scientific work had been opened to them; or, to use Helmholtz's own modest metaphor, when the smith had given to the sculptor a new tool with which he might thenceforth fashion his god-like statues and control the marble as none had done before. There are no more inspiring pages in the history of ophthalmology than those in which Donders tells the achievements of Von Graefe and Helmholtz* and those others, only lately written, in which Bowman does honour to the memory of Donders.†

From that time forward, during a period of more than 30 years, Bowman's professional life was one of extreme activity and brilliant success. His reputation and practice rapidly increased, and though, through want of leisure, elaborate histological research was no longer possible for him, papers of great practical value still came frequently from his pen. These related chiefly to new and improved surgical proceedings, and among them may be mentioned especially those on the treatment of lachrymal stricture, on division of the punctum for the relief of epiphora, on artificial pupil, on the use of two needles at once in capsular cataract, and on operations for conical cornea; and, further, the articles in which he vigorously advocated the treatment of glaucoma by iridectomy according to Von Graefe's beneficent discovery. All that he wrote was based on deliberate and thorough observation, and was expressed in simple and explicit language, without a trace of exaggeration or display.

It was, however, by oral teaching and demonstration that Bowman, during this period of his career, made the greatest impression upon his professional brethren. At Moorfields, surgeons from far and near were constantly to be seen around his desk or in the theatre, eagerly

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* See OPHTH. REV., Vol. vi., p. 65.

† Extract from *Proceedings of the Royal Society*, Vol. xlix.

listening to the few lucid words in which he discussed his cases, or watching with delight the supreme skill of his operating. We have been told by men of his own standing that, even in the earliest days of his anatomical teaching at King's College, his manner had a peculiar fascination for those who heard him. It certainly was so in later years. There was a dignity about him, a calmness of speech and movement suggesting power in reserve, and a charm in his refined face which were irresistible. It was a heavy loss to the Moorfields Hospital, and to the many who from time to time had followed his practice there, when in 1876, his sixtieth year, he resigned his surgeoncy.

Fortunately, the opportunities for professional intercourse with Bowman did not cease with his retirement from Moorfields. Until some years later he held the leading place at all the chief meetings connected with our specialty. In 1880, when the British Medical Association held its annual meeting at Cambridge, Bowman was President of the Ophthalmological Section. Donders was present also. The senate of the University conferred its honorary degree of LL.D. on both, and some of our readers will remember the enthusiasm with which the expectant section received them on their arrival from the Senate House in their newly-donned robes. In the following year Bowman presided over a still more important gathering in London—the Ophthalmological Section of the Seventh International Medical Congress. The fine nature of the man, his high ideals, simplicity and modesty, are perhaps nowhere more clearly shown than in the inaugural address given by him on that occasion.

The Ophthalmological Society of the United Kingdom was founded in 1880, and was fortunate in having Bowman as its president during its first three years. Many of the present generation of British ophthalmic surgeons owe their personal knowledge of him to those early meetings of our Society, and it was largely

through his influence that the Society rose so rapidly into strength and importance. Its funds, moreover, were largely increased by his generosity. He was an ideal president: speaking little, but always with purpose and effect, showing interest in every communication, and encouraging every effort at good work.

As a consultant he was held in the highest esteem by his professional brethren. No opinion carried greater authority than his, and no one was more carefully considerate of the welfare of the patient, or more loyal to the colleague associated with him in the case.

In the year 1883 the Council of the Ophthalmological Society resolved to establish an annual lecture—the Bowman lecture—"in recognition of Mr. Bowman's distinguished scientific position in ophthalmology and other branches of medicine, and in commemoration of his valuable services to the Ophthalmological Society, of which he was the first president." In the following year he was made a baronet in recognition of his scientific attainments and professional eminence. A little later the suggestion that his portrait should be painted and presented to him was welcomed by a large number of his friends, in this and other countries, and the well-known portrait by Ouless, which was exhibited in the Royal Academy in 1889, was the result. In graceful response to this mark of friendship and respect, a fine mezzo-tint engraving of the picture was presented to each subscriber by Lady Bowman. It was decided also to supplement the testimonial picture by reprinting the most important of Sir William Bowman's works. The issue of these is now expected shortly.

Not until he was 70 years of age did Sir William Bowman relinquish active practice, and even for some years longer he was still at times accessible to those who specially desired his opinion and advice. His last few years were spent chiefly in the retirement of his charming country house in Surrey, where, to use the words of one who had the pleasure of visiting him

there a year or two before his death, he passed, "in dignified repose, his evening of life, amid the flowers which he had gathered from all quarters of the globe, and which he tended with loving hands." The same friend says, "He had retired from the active practice of his profession, but his interest in all things pertaining to its advancement was as earnest and eager as in those years when he was at the head of ophthalmology at the world's capital. As we sat there that balmy afternoon, on the grassy slope facing the South Downs, with a silvery strip of sea stretching beyond, on which ever and anon the sunshine showed the glint of a passing sail, the discourse drifted into diverse channels, revealing always the liberality and breadth of view, and the extent of general knowledge, which made him the man he was." P. S.

[We are indebted to the kindness of Lady Bowman for permission to publish the portrait of Sir Wm. Bowman. The photograph here reproduced was taken on April 16, 1891.—EDS.]

REPORT OF THE EXAMINATION OF NINE EYES IN WHICH A FOREIGN BODY HAD REMAINED EMBEDDED FOR AN UNUSUALLY LONG TIME.

BY E. TREACHER COLLINS, F.R.C.S., ENG.

The nine cases* recorded in tabular form in this paper are of interest from the unusually long time which elapsed between the implantation of a foreign body and the enucleation of the eye. In the shortest there had been an interval of 14 years. In seven the foreign body had been embedded more than 20 years, and in case 7 as long as 28 years. In cases 1, 6, and 7 excision was performed because the eye was blind and thought to contain a foreign body, not on account of the onset of any fresh symptoms. In cases 2, 4, 5,

* From the Pathological Records at Moorfields Hospital.

8, and 9 it was the occurrence of pain which ultimately necessitated its removal, and in case 3 the onset of sympathetic ophthalmitis in the other eye. In this case sympathetic ophthalmitis did not come on until 15 years after the receipt of injury, during the whole of which time the exciting eye appears to have been quiescent. About the same time, or just before the sight began to fail in the other eye, however, it became painful. In the report of a committee of the Ophthalmological Society, based on 200 cases of sympathetic ophthalmitis,* there is only one recorded in which a longer interval than this (viz., 20 years) had elapsed between the injury and the onset of inflammatory symptoms in the second eye. Pathological examination of the exciting eye in case 3 showed it to contain a fragment of shot embedded in a cup of bone on the inner surface of the choroid; no microscopical examination of the eye was made. In the eye in case 9, in which a foreign body had been implanted 26 years, and which became painful a month before excision, microscopical examination showed, scattered throughout the uveal tract, nodules of lymphoid cells just like those met with in eyes which excite or suffer from sympathetic ophthalmitis. This eye did not give rise to sympathetic mischief, still it is interesting to find in an old injured eye fresh inflammatory changes resembling those found in eyes which excite it.

The question naturally arises in connection with these cases, Was there anything in the nature of the foreign bodies or in the position in which they lodged which allowed of the unusual tolerance which these eyes exhibited towards them?

With regard to the nature of the foreign bodies there is little to be said. All of them were metallic; all but two were either pieces of iron or steel. In case 1 it was a piece of gun-cap, and in case 3 a splinter from a bullet. It is worthy of note that in cases 1, 6, and 8

* Trans. Ophth. Soc., Vol. VI.

the foreign bodies easily crumbled up on being touched, and in cases 2 and 7 they had become oxidised on the surface. It would seem that even pieces of metal embedded in the body tend to become absorbed, and if left long enough might ultimately disappear.

It would naturally be supposed that foreign bodies embedded in structures either destitute of nerves and vessels, or only scantily supplied with them, would be less likely to cause irritation than in other parts. These cases confirm this view. In four of them, Nos. 2, 5, 7, and 9, the foreign body was situated in the lens; in two, Nos. 4 and 6, in the sclerotic; and in two, Nos. 1 and 8, in the vitreous. In case 3, as before mentioned, it was found in a shell of bone on the inner surface of the choroid. Foreign bodies that are free in the vitreous usually sink to its lowest part and lie on the posterior part of the ciliary body—a part very liable to irritation. In cases 1 and 8 this had not occurred; in the former the foreign body was encapsuled in a mass of fibrous tissue situated over the optic disc, and in the latter it lay in the anterior portion of the vitreous just behind the lens.

In cases 3, 6, and 7 bone was found within the eye. That in cases 3 and 7 was in the usual form and position, situated around the optic-nerve entrance on the inner surface of the choroid. That in case 6 was very unusual. It formed a narrow twisted band, stretching from the position of the ora serrata on one side of the globe to that on the other, and passing across the spot where the foreign body was found embedded in the sclerotic. Microscopical examination of this band of bone shows that there is a gap in the elastic lamina of the choroid beneath it, and that part of the mass of bone projects into this gap, some of it being situated in the capillary layer of the choroid. The most probable explanation of this condition is that the blow and entrance of the foreign body had caused a partial rupture of the choroid, and that the bone had developed in the plastic exudation thrown out along it.

No. of Case. Reg. No.	Name and Date of Excision.	Age at Time of Excision.	Interval between Injury and Excision.	Nature of Injury and History of Case.	Pathological Examination of Eyeball.
CASE 1. 2128.	Frank C. Aug. 3, 1886.	36	24 years.	Left eye injured by a gun-cap. Vision reduced to p.l.	Opacity in cornea ; occluded pupil, a rent in the iris opposite the corneal scar. Lens absent. A white fibrous mass situated over the optic disc protruding into the vitreous. In this mass a piece of metal found, which crumbled upon being touched.
CASE 2. 2258.	Donald G. Feb. 10, 1887.	33	24 years.	Right eye injured by a piece of iron or steel which struck him while he was watching a blacksmith at work. Sight lost 6–8 months later, but p.l. until 12 months ago. Painful lately.	T.n.—Central opacity of cornea ; anterior chamber shallow. Iris adherent to cornea at seat of the opacity, and to the lens capsule. Embedded in the lens is what appears to be a small fragment of metal, the surface of which has become oxidised ; it is not attracted by the magnet. The retina completely detached from ora serrata to O.D. There are three small cysts protruding from its outer surface.
CASE 3. 2281.	Joseph Q. March 17, 1887.	33	15 years.	Right eye struck by a splinter from a bullet which rebounded from a target After injury sight gradually failed. No trouble with it until 3 months ago, when it became painful, and about the same time the sight of his left eye became dim ; this dimness has continued up to now. Condition of left eye, keratitis punctata, slight neuritis, general haze of vitreous, pupil active, V $\frac{6}{24}$ and J8. T.n.	T-2.—Eyeball much shrunken. Sclerotic puckered. Cornea nearly clear. Anterior chamber deep. Iris green in colour, much thickened and firmly adherent to lens capsule. Lens shrunken, densely opaque, calcareous patch in its anterior part. Retina completely degenerated. Choroid has a thick plate of bone on its inner surface. In the hollow of this bony cup lies a small bent fragment of shot, around it is a large quantity of cholesterine. The seat of entrance of the F.B. is in the sclerotic, some distance from the corneal margin on the inner side.

No. of Case. Reg. No.	Name and Date of Excision.	Age at Time of Excision.	Interval between Injury and Excision.	Nature of Injury and History of Case.	Pathological Examination of Eyeball.
CASE 4. 2457.	John F. Oct. 27, 1887.	56	26 years.	Left eye struck by a piece of iron. Occasional attacks of pain.	Eyeball shrunken. Sclerotic puckered; firmly embedded in it at the posterior part below the optic nerve, is an irregular flat chip of metal. It measures 13 mm. × 6 mm. It protrudes through the posterior part of the globe. The contents of the eye are matted about this chip and the individual structures are unrecognisable.
CASE 5. 2900.	David J. July 2, 1889.	65	23 years.	Left eye struck by a piece of iron while riveting. Blind since the injury. Great pain in it the last fortnight.	Shrunken eyeball. Sclerotic puckered. Puckered cicatrix at upper margin of cornea. Lens shrunken; embedded in it is a piece of steel. An inflammatory membrane stretches across the globe in the ciliary region. Retina shrunken, and completely detached from ora serrata to O.D
CASE 6. 2910.	Henry O'M. July 13, 1889.	29	14 years.	Right eye struck by a piece of steel from a chisel.	Cornea clear. Numerous crystals of cholesterine in the anterior chamber. Sclerotic has embedded in it, and projecting slightly from its outer surface, an F.B. situated a little above and to the inner side of the optic nerve. It easily crumbles upon pressure between the finger and thumb. Lens shrunken and calcareous. Retina is completely detached except in the neighbourhood of the F.B. Choroid has on its inner surface an irregularly twisted band of bone, which measures 4 mm. in width in its widest part, and which is raised some height above the surrounding choroid. It extends from the ora serrata on one side of the globe and passes below the optic disc to the ora serrata on the opposite side. Microscopical examination shows this band to consist of trabeculæ of true bone, with well-marked lacunæ. There is a gap in the elastic lamina of the choroid, and in the uveal pigment layer where it is situated. Most of it is on a level internal to the elastic lamina; some of it, however, is situated in the tissue of the choroid itself, in the capillary layer. The vessels of the choroid about this band of bone are much dilated.

No. of Case. Reg. No.	Name and Date of Excision.	Age at Time of Excision.	Interval between Injury and Excision.	Nature of Injury and History of Case.	Pathological Examination of Eyeball.
CASE 7. 3172.	Richard D. June 24, 1890.	47	28 years.	Left eye injured by a chip of steel. Patient states that a piece was removed soon after the injury. Has never seen with the eye since the accident.	Calcareous opacity of cornea in its lower part. Pupil filled by a thick mass of fibrous tissue which unites the iris to the cornea at the seat of the opacity. Lens shrunken and displaced downwards; embedded in it is a piece of metal, which has become oxidised on the surface. An inflammatory membrane stretches across the globe behind the lens in the ciliary region. Umbrella-shaped detachment of retina. Choroid much atrophied, a plate of bone on its inner surface around the O.D.
CASE 8. 3183.	George W. July 5, 1890.	42	20 years.	Left eye wounded by a piece of steel; blind since. No pain until 3 days ago.	T increased.—Faint opacity about the centre of the cornea. Lens shrunken. White in colour, with cholesterine crystals in it. It lies in front of the iris, in the lower part of the anterior chamber. Just behind the lens, in the outer half at the lower part of the eye, is a small piece of metal, which easily crumbled up on being touched. The anterior chamber is shallow, its angle narrowed. There is marked pigmentation of the retina and atrophy of the choroid. The optic disc is cupped.
CASE 9. 3607.	George L. January 28, 1892.	46	26 years.	Right eye injured by a chip of steel. Sight gradually failed. Quite blind 15 years. No pain until a month ago.	Scar in lower part of cornea. Anterior chamber deep. Pupil small and eccentric; hole in lower part of iris. Uveal pigment on back of iris absent for a short distance around this hole. In the outer half of the globe, suspended by a thin tag of grey membrane attached to the posterior border of the ciliary body at the upper part, is a small fragment of metal about 2 mm. square. It floats free except for this tag. The lens is absent; probably the piece of metal lodged in the lens, which has become absorbed from around it and the membrane by which it is suspended, represents the remains of lens, capsule and suspensory ligament. There are numerous branching pigment patches in the retina, chiefly in the equator, and considerable choroidal atrophy. Microscopical examination shows nodules of round cells scattered throughout the choroid ciliary body and iris.

Otto Schirmer (Königsberg). **On Vaccinola of the Lid-Margin.** *Bericht u. d. Ophthalmol. Gesellschaft, Heidelberg*, 1891.

The cases commented on were seven in number, six had been treated by Dr. Schirmer recently, and one three years before in Göttingen. The disease in six cases was confined to one eye, in one case it occurred on both sides; all the patients were adults, and in five cases the possibility of inoculation from the presence of freshly vaccinated children in the patient's home was established.

The affection commenced in all the cases with inflammatory oedema of the lids; in a few days a superficial round ulcer with a whitish floor was noticed by the patients, generally at one of the canthi, and at this stage they came to the clinique. The ulcer had a hard infiltrated base, was very superficial, involved the margin and neighbouring skin of the lid, and attained in a few days the size of a sixpenny bit; the white deposit on it could be pulled off, exposing a granulating floor, very prone to bleed. The ulcer rarely spread to the conjunctiva, which was, however, always greatly chemosed, but along the lid-margins small pustules, which rapidly broke down to form ulcers, appeared in succession from about the 8th to the 12th day. These appeared to be caused by re-infection; if, for instance, one was present on the lower lid-margin, a corresponding one on the upper was sure to appear next day; the entry for the virus being probably given by the hair follicles. The patients felt unwell, had no appetite, and in two cases there was rise of temperature; the oedema was always considerable, and the base of the ulcer so hard as to remind one of a chancre, but the anamnesia and the course of the disease with the white deposit and superficial nature of the ulcer were decisive as against this diagnosis; a typical clear vaccine vesicle was never seen, perhaps, as suggested by Schirmer, on account of the close neighbourhood of the conjunctival sac full of pyogenic organisms. Under an expectant treatment healing occurred without leaving any scar, and was complete at the end of three months.

In three cases there were corneal complications. In one this was only a marginal infiltration which soon became vascular and cicatrised, but in the other two it was of a more serious nature. In both these cases the cornea was attacked while the ulcer was healing; in one case, that, namely, in which both lids had been affected, both corneæ were attacked. The condition of the cornea may be best described as a keratitis profunda, in the centre of the cornea a dense grey infiltration in the deeper layers was visible, either homogeneous or streaky, and round this a very curious single or double ring of lighter grey infiltration, which seemed to lie behind the central infiltration. The peculiar shape of this ring led Schirmer to suggest that it was caused by a fibrinous layer on the posterior surface of the cornea, which had a tendency to shrink and become rolled up at the margins—the repetition of this process giving the double ring. The iris was slightly discoloured, the circum-corneal vessels injected, and in one case there were slight deposits on the post-surface of the cornea.

In no case of this peculiar corneal complication was a complete cure attained; though ulceration never occurred, the irritation subsided, but the opacity, though less dense, remained and preserved very much its original form, only the concentric rings becoming irregular and tending to coalesce. This keratitis resembles that occurring as a complication of true small-pox, which also begins after the crisis of the disease. The fact that six cases of vaccinola should have occurred independently at the clinique, when for some years before there had been no cases, is remarkable, and bacteriological investigations on the subject are being carried on by Fränkel, who believes that he has found a streptococcus hitherto undescribed, but his experiments are as yet incomplete. The disease in the lids differed so much from ordinary vaccinola that Dr. Schirmer believed at first that he was dealing with a new form of ulceration, and even when the diagnosis was established he thought the cases worth recording, more especially on account of the peculiar corneal complication which is described above.

W. G. T. Story.

Hirschberg (Berlin). **Vaccinal Eruption on the Eyelids.** *Centralbl. f. pr. Augenheilk., Jan.*, 1892.

The author reports the case of a female patient at 38, under his care, in whom an ulcer formed upon one upper eyelid, attaining the size of a *centime* piece. This ulcer presented an indurated border, a yellowish floor, and was accompanied by considerable swelling of the eyelids and of the same side of the face. There was inflammatory enlargment of the præ-auricular gland. The eye itself remained unaffected.

The symptoms had come on about three days before the patient came under observation, and there was scarcely any doubt that the inoculation had occurred from the vaccinia pustules of the patient's child.

Severe pain, with some rise of temperature, continued till the fifth day, after which the symptoms subsided, and the case was complete in about a fortnight. Hirschberg draws attention to the difficulty of diagnosing these cases correctly in an early stage, their infrequency being an additional source of difficulty.

J. B. L.

Badal and Lagrange (Bordeaux). **Primary Carcinoma of the Ciliary Body.** *Arch. d'Ophthalmol., March*, 1892.

The case described by Badal and Lagrange is one of more than usual interest. The tumour, which was carefully examined, and the histological characters of which are depicted in the lithographic plates accompanying the paper, apparently originated in the cylindrical epithelium of the ciliary processes. The following are the details of the case:—

In March, 1891, a little boy, eight years of age, was brought to Badal. He had previously been seen by several medical men.

The family history was unimportant. The child's left eye had been noticed to present a peculiar appearance soon

after birth ; the pupil was larger than that of the right eye, and the parents thought the sight of the left was defective. When about five years of age the left eye became blind, without pain, and soon after this the eyeball began to enlarge. Three years later, when the question of an operation came to be discussed, the eye was injected, protruding, and about a quarter larger than the fellow eye ; the cornea was about normal, the anterior chamber very deep, the pupil widely dilated, and no fundus reflex obtainable on ophthalmoscopic examination. By oblique illumination a rose-coloured reflex was seen through the pupil, without any visible vessels. At the upper part, just beyond the corneal margin, there was a staphyloma the size of a bean ; a somewhat larger staphyloma, with a wavy surface, occupied the ciliary region below. The sclera was much thinned at the site of these staphylomata, and through it dark vascular masses could be seen. The eye was not very painful, but apparently was rapidly increasing in size. Enucleation was performed, and it was noted that the posterior part of the globe and the optic nerve were apparently healthy. Twelve months later there was no sign of recurrent growth, and the child was in good health.

The eye-ball, after removal, was preserved in alcohol, and on examination presented the following macroscopic appearances. The vitreous and crystalline lens escaped when the globe was opened ; the retina was completely detached ; the choroid remained in contact with the sclerotic ; the latter, as also the optic nerve, appeared to be quite normal. The new growth, which was confined to the ciliary region, consisted of two unequal whitish nodules placed alongside each other, as shown in the drawing alluded to above. These nodules extended from the ciliary part of the sclera to the equator of the crystalline lens, with which they were in contact. The larger nodule was the size of a pea, the other but slightly smaller ; their appearance closely resembled that of a white sarcoma of choroid. A shallow groove separated them in the upper part, but they were continuous at the base. The choroid appeared to stop at the posterior border of the growth ; the iris was involved anteriorly.

Examination of microscopic sections made through the thickest part of the tumour led to the following description. The sclera which limited the new growth externally was slightly atrophied ; near the posterior margin of the growth a thin layer of choroid was distinguishable on its inner surface, but more anteriorly it was split into two layers, the inner of which became lost in the neoplasm. The tumour itself in section showed numerous areas, unequal in size, which stained more deeply than the surrounding tissue, and, even with low magnification, tubes with central lumen were easily made out. These tubes were especially abundant in the anterior portion of the growth. Drawings of sections through this part, examined under a high power, are given, and depict numerous well-defined tubules lined with a very regular cylindrical epithelium. Some of these tubes are circular, others flattened by pressure, or perhaps seen in oblique section. The epithelial cells are large, well formed, and contain one, and sometimes two nuclei. The number of tubules with a large central lumen is comparatively small, but there are very numerous smaller tubules filled with cells which undoubtedly result from the proliferation of their lining epithelium. Such intra-canalicular cell proliferation is met with in duct cancer of the breast, and as in such tumours, so here the proliferated cells become more or less atypical in character. The appearances in some sections suggest that the walls of these tubes overfilled with cells have given way and allowed the escape of their contents ; in this way islands of cells are formed, in some of which degeneration is evident. To sum up, the histological examination of the growth revealed (1) regular tubules with a central lumen, and lined by a single layer of cylindrical epithelium ; (2) similar tubules, filled with proliferated epithelial cells ; (3) collections of atypical and deformed epithelial cells, grouped and separated by thin strands of connective tissue. The tumour was very sparsely supplied with new vessels, and the normal elements of the ciliary body had, to a very large extent, disappeared ; vessels, muscle fibres, and pigmented cells were almost entirely absent.

The case here reported resembles in some features one

published by Gayet in the *Archives d'Ophthalmologie*, 1889, under the title of "Adenoma of the Choroid." Gayet states that the tumour in his case was becoming in places carcinomatous; in his patient there was also carcinoma of the stomach, and the author was inclined to look upon the choroidal growth as secondary.

The case so fully described by Badal and Lagrange is pathological evidence which strongly supports the views advanced by Nicati and Treacher Collins concerning the glands of the ciliary body.

J. B. L.

DE WECKER & MASSELON (Paris). Symmetrical Tumours of the Lacrimal and Parotid Glands. *Arch. d'Ophthalmol., Feb.*, 1892.

Cases of symmetrical tumours of the lacrimal and parotid glands are, judging from published records, very uncommon. The authors refer to four previously recorded cases, which, with the present communication, seem to compose the total number to be found in medical literature. Fuchs* reported the case of a man, æt. 61, otherwise healthy, with painless tumours of the lacrimal and parotid glands on both sides; the growths had been noticed for five months; they were slightly lobulated on the surface, hard, not tender, and those in the lacrimal glands did not limit the movements of the eyeballs, although they interfered somewhat with elevation of the upper lids. The other salivary and lymphatic glands were unaffected. A small portion of one of the orbital tumours was removed, and on microscopic examination was found to present the structure of a lymphoma. The patient was under treatment and observation for a year, but without appreciable alteration.

A second case recorded by Haltenhoff† was that of a rather anæmic girl, æt. 12, in whom a slowly progressive

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* *Beitr. z. Augenheilk.*, III, *p.* 8.
† *Ann. d'Oculist.*, CII., *p.* 110.

enlargement of the lacrimal and parotid glands occurred; the submaxillary glands also became affected. A year later the swelling of the lacrimal and parotid glands had almost disappeared, but the submaxillary enlargement had increased.

A third case was shown to the Medical Society of Kœnigsberg by Mikulicz. In this patient the swelling involved the lacrimal and all the salivary glands, and the case was thought by Mikulicz to be one of lymphosarcoma.

Gordon Norrie* reported a fourth case, which was probably one of dacryo-adenitis during mumps.

De Wecker and Masselon's patient was a soldier, æt 26, in robust health and with good family history. In March, 1891, swelling of the upper eyelids was noticed; this steadily increased, so that about the end of June he was scarcely able to open his eyes. At the same time a swelling occurred in each parotid region, but was more marked on the left side. In August, when he first came under the care of the authors, the swelling of the lids had narrowed the palpebral fissures to mere chinks. The skin of the upper lids was not discoloured; beneath it could be felt, best on the left side, a hard bossy tumour, the size of a filbert nut. Each parotid region was occupied by a hard tumour, more uniform on the surface than those in the orbits. There was no pain or tenderness on pressure.

The lacrimal tumours were removed by operation; they were exposed from the conjunctival surface, but only the anterior portions taken away, as on dissection the growths were found to extend deeply into the orbits. The tumours were examined microscopically by Dr. Lateux, who reported them to be "epithelial tumours of the lacrimal glands." A plate of the appearances seen in sections of the growths is appended.

The pathological and clinical diagnoses are, in the authors' opinion, not in accord; clinically the case presented none of the features usually found in malignant growths. Two months after the operation the patient was in perfect health; there was very slight swelling of the right lid as compared with the

* *Centralbl. f. Augenheilk.*, 1890, *p.* 223.

left; the parotid tumours were diminishing in size. Time will probably determine the nature of the growths, whether benign or malignant, and it is to be hoped that the authors will be able to supplement this report of their case by its after-history.

J. B. L.

L. DE WECKER (Paris). Sympathetic Ophthalmia after Operations. *Ann. d'Oculist., Feb.*, 1892.

De Wecker asks for the experience of those who have ceased to operate for cataract after Von Graefe's method, on sympathetic ophthalmia.

His own results show that since he adopted the flap extraction and gave up iridectomy, he has not had a single case of sympathetic ophthalmia.

Repeating some remarks made at the Heidelberg Congress in 1875, he says that the disadvantage of excising a portion of the iris lies in the fact that the corneal wound is left in contact with the wound in the capsule, whereby irritation is set up in the iris and ciliary body. Again, the position of the section in the linear operation is in the extensive pericorneal tissue, which is little likely to result in the rapid formation of an impermeable cicatrix. Hence he comes to the conclusion that, in order to escape sympathetic ophthalmia, there should be a rapid formation of an impermeable cicatrix isolated from contact with the neighbouring parts.

Taking the result of his cases, 1,500 were operated on during a period of eight years by a section approximating to that of V. Graefe, combined with iridectomy, and among them there were five cases of sympathetic ophthalmia. During a period of twenty-two years, 5,000 flap extractions have been made with or without iridectomy, with only two cases of sympathetic ophthalmia, which apparently occurred before the adoption of the purely corneal section.

W. T. HOLMES SPICER.

F. Dimmer (Vienna). **On the Light Reflex from the Retinal Vessels.** *Bericht u. d. Ophthalmol. Gesellschaft, Heidelberg*, 1891.

When a concave mirror is used to examine in the erect image an emmetropic eye, an inverted image of the flame is formed some distance in front of the retina, but this image cannot be considered as the illuminating object for a very small reflecting surface in the retina, rather, according to Dimmer, must the mirror be considered as the source of light, the illumination being effected by a cone of rays whose base is the pupil and whose apex the illuminated point in the retina. This also applies when the image of the flame is formed behind the retina, as it is when a plane mirror or Helmholtz's mirror is used.

Hence Schneller's mistake: he supposed the inverted image in the vitreous was the illuminating object, and that therefore the light streaks on the vessels varied in size with the focal length of the mirror used. This, according to Dimmer, is not the case, as, no matter what the distance of the lamp from the mirror, the streaks remain the same size, whereas, if the pupil is enlarged, the light streak, at least on the veins, increases in breadth.

With a narrow pupil the streaks are equal to $\frac{1}{10}$ or $\frac{1}{12}$ of the diameter of the vessel on the veins, and to $\frac{1}{3}$ or $\frac{1}{4}$ of the diameter on the arteries. On the veins the streak is white, on the arteries shining pink (hellroth glänzend). On the arteries the streak can be seen almost all along their course, on the veins it is interrupted in places and of varying breadth; this is owing to the fact that if the vein is not at right angles with the line of vision, the reflex disappears, whereas, in the arteries, if they are slightly oblique to the line of vision, it is still seen. Rotation of the mirror causes movement in the streaks, but movements of the observer's head and mirror cause a movement of the streaks in the opposite direction; this is most marked on the veins.

Dr. Dimmer placed a lens of 7 mm. focal length in front of a red background, the space between them was filled in with a mixture of cedar oil and castor oil, of nearly the same

refractive index as small tubes of glass, which could be shoved in in front of the red background; the edges and lumen of the glass tubes were visible even when they were filled with this mixture, but no reflex could be got with the ophthalmoscope from any part of them, and this, according to Dimmer, may be regarded as a proof that the light streaks seen on the vessels of the eye do not come from the walls of the vessels whose refractive index is so nearly identical with that of the surrounding media that they are invisible. When filled with milk, or ink, or blood, the tubes gave a light streak, which was always white, and which corresponded in size to the breadth obtained by a calculation taking into account the width of the artificial pupil and the distance of the tube from the pupil (made equal to 19 mm., as in the human eye). When tubes of larger calibre were used the streak was doubled, rotation of the mirror did not affect the double streak, but movements of the head and mirror caused the streak on the side towards which the movements were made to disappear; this Dimmer explains by saying that the double streak is an elongated image of the ring of light round the central hole of the mirror; when the hole is moved away from the centre of the pupil, only a sickle-shaped part of the ring is left to illuminate the eye, and the streak corresponding to the ring outside the pupil disappears, the streak, therefore, on the side towards which the mirror is moved. When an unbored mirror, as Helmholtz's, is used, no doubling of the streak is seen.

According to these experiments, therefore, only the streak on the veins can be explained as a reflection from the anterior surface of the blood column.

To explain that on the arteries, Dimmer has examined the eyes of dogs and frogs. In the latter, on the large vessels, a streak $\frac{1}{3}$ of the diameter of the vessel can be seen; it is glistening, white and has a flowing appearance; it has been explained by Hirschberg to be the axial blood-stream (axenstrom) seen by the reflection of light from its corpuscles. If the blood-stream be arrested the streak is changed to an irregular mass of bright spots and flakes. In the dog's eye the streaks are also broad, $\frac{1}{3}$ or $\frac{1}{2}$ the diameter of the vessels, and are a shining pink (hellroth glänzend)

When the optic nerve is ligatured the arteries become thread-like, but the veins remain about the same size, the streak on them, however, at the moment the circulation is stopped, becoming narrow (about $\frac{1}{8}$ or $\frac{1}{6}$ of the diameter of the vessel), in fact, just the size it should be if it be a reflection from the anterior surface of the blood column. The broad streaks, therefore, on a frog's blood-vessels and on those of a dog when the blood is flowing are the axial stream (axenstrom), made visible by the reflection of light from the corpuscles; in the dog's eye no movement of the stream can be seen, as the corpuscles are smaller and less magnified on ophthalmoscopic examination. The narrow streak seen on a dog's veins when the circulation is arrested is a reflection from the anterior surface of the blood column.

From all these observations Dimmer concludes that the streak on the veins of the human eye is a reflection from the anterior surface of the blood column, since—

1. Its breadth corresponds to what it should be if calculated as a reflection from that surface.

2. Its colour is pure white, as in the experiments with the glass tubes.

3. The breadth of the streak in the veins of a dog's eye when the circulation is arrested, corresponds to the breadth of the streak in the veins of a human eye.

4. The breadth of the streak varies with the breadth of the pupil.

5. Its breadth is too small for it to come from the axial stream, as may be seen by comparing it with the streak in a frog's vessels.

The reason we see the axial stream in a dog's veins and not in a man's is owing to the lighter colour of the blood in the former.

The streak on the arteries in the human eye is made by the axial stream, because—

1. The streak is too broad to be a reflection from the anterior surface of the blood column.

2. The streak is pink (hellroth), this colour being given to it by the peripheral layer of blood through which it is seen.

3. Its breadth corresponds to that of the streaks in a dog's eye, which are certainly caused by the axial stream.

This being the cause of the arterial streak it is easy to see why the reflection is more continuous than on the veins, and is to be seen even when the vessel is not quite at right angles to the line of sight.

In both veins and arteries the apparent movement of the streak in the opposite direction to the movement of the head and mirror must be explained by the fact that more of the vessel becomes visible on the side towards which the head is moved.

W. G. T. STORY.

F. DIMMER (Vienna). The Ophthalmoscopic Light Reflections from the Retina. *Bericht u. d. Ophthalmol. Gesellchaft, Heidelberg*, 1891.

In young persons white streaks, often taking the shape of a ring or a sickle, may be seen alongside of or between the larger retinal vessels on ophthalmoscopic examination. Rotation of the mirror does not affect them, but joint movements of the head and mirror cause them to move in a direction opposite to that of the mirror. They seem to lie in the vitreous, in front of the retina, as they can be best seen with a lens 1D. or 1.5D. stronger than that used for the fundus oculi. Weiss believes that these are caused by clefts in the vitreous. The superficial layers of the retina are raised up by the larger vessels; between these elevations are cylindrical-shaped depressions, and where many vessels are near one another these depressions may be even spherical. The author believes that the reflections mentioned above are from these concave surfaces, and are therefore reflections of that part of the mirror which lies before the pupil, as explained in the author's paper on "The Light Streaks on Retinal Vessels."

The sickle-shaped reflection seen in myopic eyes at the inner side of the disc, described by Weiss, and supposed by him to be due to a detachment of the vitreous, is also, according to Dimmer, due to one of these concave surfaces, caused in this instance not by a vessel but by the heaping

up of the nerve-fibres at the inner side of the disc, which occurs in myopia ; when the myopia increases the heaping up of the fibres, and with it the reflection disappears. This reflection, as noticed by Weiss, is sometimes seen double, and when this is so, joint movements of the head and mirror cause disappearance of that part of it which is on the side away from the movement of the mirror ; taking into account the behaviour of the double light streak on a glass tube, explained in the author's first paper (see page 149), it is seen that this reflection must be caused by an inverted image of the light lying in front of the retina, and moving, therefore, with relation to the mirror, as described.

The dark patch encircled by a bright ring, seen by the indirect method at the macula lutea, has been, as is well known, explained in various ways ; with none of these does the author agree. He remarks that this macular reflex may be seen in eyes with mydriasis in the inverted image ; the darkness of the region inside it is, however, not seen unless special arrangements are made with lamp, mirror, lens, etc., to throw in parallel bundles of light on the retina, when it becomes visible. In the upright image this macular reflex is not usually seen, but if a mirror of short focal length, (8 c.m.) and a lamp, not more than 20 c.m. from it, are used, the reflex is seen in all those eyes in which it was seen by the indirect method, or when by a special arrangement parallel rays of light are thrown on the retina and, therefore a large quantity of light, it is even better seen.

To find out if the macular reflex could be explained by reflection from the surface of the retina, the author examined five normal eyeballs ; these were bisected and hardened ; in only two did no detachment of the retina take place, and in these two the hollow of the fundus foveæ (Kuhnt) was found to have a diameter of 2 mm. and 1·8 mm. respectively, and the clivus made with the plane of the retina outside it an angle of 10°, or 12°. One of these preparations was photographed (enlarged 50 times), and fixed in position at the back of the diagram of an eye also enlarged 50 times, and the paths of the rays of light falling on various parts of the retina calculated.

It was found that from the points where the retina slopes

towards the fundus foveæ no regularly-reflected light can reach the pupil, which accounts for the dull appearance of this region, and that, on the contrary, nearly all the light from the convex surface of the retina where it is raised up before sloping down to the fundus foveæ is reflected, causing the ring of light seen round the macula, which is more sharply bounded on the inside owing to the greater regularity of the convexity internally. With a dilated pupil there is so much diffuse reflected light on the fundus that these appearances are not so plainly seen, but if powerful illumination is made, as by throwing in parallel bundles of rays in the indirect method, the ring may be plainly seen, and also the dark central region, though not so well as when the pupil is narrow.

In the middle of the fovea a sickle-shaped reflex can usually be seen when a mirror with a hole in it is used. The sickle becomes a full circle in some eyes, and, if a Helmholtz's mirror be used, a disc, and it was owing to his use of the unsilvered ophthalmoscope that Jaeger was led to describe this foveal reflex as a bright spot.

This reflex is evidently, according to the author, the inverted image of the centre of the mirror; and, in fact, if a part of the mirror be blackened, a break in the ring of light can be seen on the side opposite to the black on the mirror. This reflex must also be caused by a concave surface at the fovea, and Kuhnt has described one; this would be too small, according to Dimmer. On examining his two hardened eyes, Dimmer found the surface of the retina plane at the fovea, but he noticed that in both the specimens there was a slight detachment just at the fovea, and when this was replaced it caused a depression—in one case 0·25 mm., in the other 0·12 mm. wide, which would account for the reflex.

W. G. T. Story.

A. v. HIPPEL (Kœnigsberg). The Treatment of Trachoma. *Bericht u. d. Ophthalmol. Gesellschaft, Heidelberg*, 1891.

Owing to the unsatisfactory results of the many methods of treatment in vogue for trachoma, Von Hippel was induced to give an extended trial to the method recommended by Keining of Svest, viz., the rubbing into the conjunctiva of the everted lids a solution of corrosive sublimate (1·2,000).

From September, 1890, to August, 1891, more than 300 cases of trachoma were so treated in his clinique. The eye was cocainised, the lids then everted, and the conjunctival surface rubbed with a piece of cotton wool dipped in the sublimate solution. When the conjunctiva was hyperæmic and swollen the rubbing was much less energetically carried out than when it was cicatrised or less vascular. When possible the contents of the trachoma bodies were squeezed out. The rubbings were carried out daily.

Von Hippel, on the whole, thinks highly of the method, and states that by its use mild cases may be cured with certainty, that severe cases may be sometimes cured and nearly always improved, and that corneal complications, such as pannus and ulceration, are favourably affected by the treatment. Less shrinking of the conjunctiva was observed after it than after other forms of treatment. A short account of his results follows:—

	No. of Cases.	Average Number of Days under Treatment.	Cured.	Improved.	No result.	Disease Recurred in
1. Follicular Catarrh ...	10	19·24	10	—	—	2
2. Acute Trachoma without Pannus... ...	21	35·5	18	3	—	—
3. Acute Trachoma with Pannus	20	47·6	13	6	1	3
4. Chronic Trachoma without Pannus ...	4	29	4	—	—	—
5. Chronic Trachoma with Pannus ...	41	47·2	33	6	2	10
6. Old Trachoma with Pannus	4	66	—	—	4	—

In Group 3 the pannus, infiltrations, and ulcers were

cured in 6 cases, improved in 14. Acuity of vision increased in 15 cases from $\frac{1}{10}$ to $\frac{8}{10}$.

In Group 5 the pannus was cured in 5, improved in 25, and unchanged in 11 cases. Acuity of vision increased in 27 cases from $\frac{1}{10}$ to $\frac{8}{10}$; no improvement of vision in 12 cases.

W. G. T. STORY.

REPORT OF A COMMITTEE ON COLOUR-VISION APPOINTED BY THE COUNCIL OF THE ROYAL SOCIETY.

REPORT OF THE COUNCIL OF THE BRITISH MEDICAL ASSOCIATION ON THE CONTROL OF RAILWAY SERVANTS' EYESIGHT.

Published by the Association, 1892.

These two reports, appearing as they do under high authority and representing an inquiry at once scientific, thorough, and impartial, should lead with little delay to the introduction of certain much-needed reforms. It detracts nothing from the importance of the declarations which these two committees have made to say that they prove, and insist on nothing which has not been proved and insisted on before. Experts in questions relating to eyesight have long been well aware that the tests which have been more or less employed in our mercantile marine and railway services are inadequate to ensure the exclusion of men who suffer from defects of sight, which unfit them for the duties which they have to discharge, and which, therefore, involve serious danger to life and property. During the last ten years this subject has repeatedly been brought to the notice of responsible persons by those who are entitled to speak with authority, and, among other efforts to bring about a better state of things, the Ophthalmological Society appointed a deputation to interview the Secretary of the Board of Trade. But the practical man in this country holds faithfully to his rule of thumb, and has little desire to profit by the teachings of science, and even the official mind is not always open for the reception of new ideas; hence, as in the present case, a real and urgent requirement is

apt to be delayed and put aside because the subject is one which demands some technical knowledge for its comprehension, and is not immediately intelligible to the uninstructed. Nothing is done in the way of improvement until some such overwhelming force as a declaration by the Royal Society is brought to bear upon the matter. Now, however, that the two reports before us have established in the completest manner the need, in the interests of public safety, of a more trustworthy and systematic testing of the eyesight of railway servants and sailors, we may hope that some result will be perceptible before very long.

Most of our readers will probably think it desirable to study the reports in their entirety, but it may be convenient to place in these pages a short statement of the general drift of the inquiries, and a literal reprint of the recommendations which the committees have made.

The Committee on Colour-Vision appointed by the Council of the Royal Society on March 20th, 1890, consisted of eleven members, all of them well known in the scientific world, nearly all fellows of the Royal Society; its chairman was Lord Rayleigh, Sec. R. S.; its secretary, Captain Abney, C.B., F.R.S. The committee held thirty meetings, and examined more than 500 persons as to their colour-vision. They tried various methods and apparatus. They examined as witnesses a number of gentlemen representing boards of trade, the science of navigation, steamship and railway companies, and the ophthalmic branch of medicine. In order that their recommendations and the grounds on which they have made them may be intelligible to those who are concerned, a careful description of the characters of normal colour-vision, and of the many and not uncommon variations therefrom, is given as a part of the report. There are some few people who fail to distinguish blue from green, and others, equally few, who

only see in monochrome; but the colour-blindness which is most common, and therefore most dangerous—especially as the colours generally used for signals are red and green—is the so-called *red-green blindness.* A red-green blind person will regard a certain hue of green as identical in colour with some hue of red, and another hue of green as identical with white ; some will entirely fail to see red of a particular hue. Examination of such persons by means of the spectrum shows that this form of colour-blindness may be divided into two classes, which for convenience may be termed *green-blindness* and *red-blindness.* To the normal eye the part of the spectrum which appears brighter than any other is the yellow; to the green-blind it is nearly at the same place; to the red-blind it is the green. To a person belonging to either of these two groups there is in the spectrum a green which he cannot distinguish from white, and which may be designated as his neutral colour. On the one side of this neutral band in the spectrum he will see green or red, more or less diluted with the neutral colour, and on the other side blue, also similarly diluted. The dilution increases as the neutral point is approached, and for some little distance on each side of it—unless a comparison with white be at hand—the dilution is so large that the colour may be mistaken for the neutral colour, that is for white. In the pamphlet before us is a coloured plate showing the modified spectrum as it appears to the green-blind and the red-blind ; also a table showing the modifications which signals of red and various hues of green will undergo when seen by colour-blind persons.

When signal lights are used as tests, colour-blind persons may sometimes be able to name the colours correctly, recognising them by their relative brightness, and by their dilution with neutral colour. The committee confirmed this by practical tests; men absolutely colour-blind passed such tests without being detected.

The test is therefore inadequate for safety, for the

recognition of a colour-signal by its brightness might easily become fallacious under the influence of a dirty glass or a misty atmosphere. The red signal of danger might then be mistaken for the green or white signal of safety, and *vice versa*, especially as the signal light has, as a rule, no white light adjacent to it with which it may be compared.

Incomplete colour-blindness is less likely to lead to accident than that which is complete; but any colour-blindness in which there is approximately a neutral or grey point in the spectrum should be regarded with great suspicion.

The foregoing relates to congenital colour-blindness. The report also deals briefly with colour-blindness caused by disease. This, unlike the congenital form, is invariably associated with defective form-vision, whence it follows that a man who has once possessed normal colour-vision cannot lose it without at the same time becoming defective as to form-vision, and need only be tested, in subsequent examinations, with regard to the latter.

The committee declare their belief that every colour-blind person employed afloat, or upon railways, in certain capacities must of necessity be a source of danger to the public; they have direct evidence that a considerable number of colour-blind people, officers and seamen, are actually at sea at the present time; and with regard to railways they are forced to the conclusion that some men, whose vision is defective for colour and for form, are in all likelihood employed in positions where normal vision is essential for public safety. They point out, moreover, that in judicial inquiries relating to causes of accidents, steps have not hitherto been taken—at least as a rule—to ascertain whether they were due to defective vision, and their recommendations contain a clause to obviate this omission.

The committee consider that many of the tests now in use, including those officially adopted by the Board

of Trade, and the methods of applying them are open to very grave objection. From this condemnation, however, those used by the Royal Navy are entirely excepted. "They are most efficient, and of such a nature that it may be presumed that no one can pass them who is sufficiently defective in colour-vision to be any source of danger." After practical trials of many different methods of testing the colour sense, and also from theoretical considerations, the committee are of opinion that the simplest efficient test is the wool-test of Holmgren, applied either in the form which Holmgren recommends, or in that of Jeaffreson, which is based on precisely the same principles. The standard test colours approved by Holmgren have been referred to the spectrum, and their exact characters are given in numbers by the committee, so that, in case of accident at any time to the sealed pattern skeins, the exact hues can be reproduced from the spectrum by a reference to these numbers.

In addition to their own conclusions, the committee set forth in the report the details of the evidence laid before them, and in an appendix are given certain descriptions of methods, previous investigations, etc.

The recommendations on which the committee unanimously agreed are as follows:—

1. That the Board of Trade, or some other central authority, should schedule certain employments in the mercantile marine and on railways, the filling of which by persons whose vision is defective either for colour or form, or are ignorant of the names of colours, would involve danger to life and property.
2. That the proper testing, both for colour and form, of all candidates for such employments should be compulsory.
3. That the testing should be entrusted to examiners certificated by the central authority.
4. That the tests for colour-vision should be those of Holmgren, the sets of wools being approved by the central authority before use, especially as to the cor-

rectness of the three test colours, and also of the confusion colours. If the test be satisfactorily passed, it should be followed by the candidate being required to name without hesitation the colours which are employed as signals or lights, and also white light.

5. That the tests for form should be those of Snellen, and that they should be carried out as laid down in the appendix vi. It would probably, in most cases, suffice if half normal vision in each eye were required.
6. That the candidate rejected for any of the specified employments should have the right to appeal to an expert approved by the central authority, whose decision should be final.
7. That a candidate who is rejected for naming colours wrongly, but who has been proved to possess normal colour vision, should be allowed to be re-examined after a proper interval of time.
8. That a certificate of the candidate's colour-vision and form-vision according to the appointed tests, and his capacity for naming the signal colours, should be given by the examiner; and that a schedule of persons examined, showing the results, together with the nature of the employments for which examinations are held, should be sent annually to the central authority.
9. That every third year, or oftener, persons filling the scheduled employments should be examined for form-vision.
10. That the tests in use, and the mode of conducting examinations at the different testing stations, should be inspected periodically by a scientific expert, appointed for that purpose by the central authority.
11. That the colours used for lights on board ship, and for lamp signals on railways, should, as far as possible, be uniform, and that glasses of the same colour as the green and red sealed pattern glasses of the Royal Navy, should be generally adopted.
12. That in case of judicial inquiries as to collisions or accidents, witnesses giving evidence as to the nature or position of coloured signals or lights should be themselves tested for colour and form-vision.

(Signed) RAYLEIGH.

The report of the Council of the British Medical Association on the efficient control of railway servants' eyesight was prepared by a committee appointed by the Council on October 21st, 1891. The chairman of the committee was Mr. N. C. MacNamara, the secretary, Dr. Geo. Mackay, and the five other members also were all well-known ophthalmic surgeons.

The report begins with an interesting historical account of the many efforts which members of our profession in different parts of the world have made from time to time to induce the authorities to take efficient action in this matter. It is interesting to know that the late Dr. George Wilson of Edinburgh was the first person who drew public attention to the subject, by several communications to the Royal Scottish Society of Arts in the years 1853 to 1855, and that the method of testing with coloured wools elaborated by Holmgren, and now always associated with his name, was previously employed by Wilson. It is less satisfactory to learn that though we, in Great Britain, had the start in this matter, we are at present much behind many other countries as regards the measures which have been adopted for the safety of the public. Up to the present time there have been no government regulations issued in this country controlling the eyesight of railway servants; each company adopts or neglects precautions as it pleases. In many other countries, especially in Holland, Sweden, France, Italy, and the State of Alabama, prudent care is exercised; definite methods of examination and definite standards of visual power are required; the more responsible the duty the higher is the standard of sight required; and the examinations are invariably entrusted only to medical men—in Holland and Italy to ophthalmic surgeons.

The committee endeavoured to obtain precise information as to the method of sight-testing employed on every British railway, and, through the courtesy of the respective managers and in some cases of the medical

officers, they obtained returns which may be considered as fairly complete. It appears that some few Companies employ no visual tests or have no definite methods of testing, and that as concerns the others the present want of regulation has led to the adoption of methods which do not generally secure the safeguards desired by the Companies themselves, which in some cases do injustice to the Companies' servants, and which do not sufficiently ensure the safety of the public.

The report exhibits the present defects under various headings. Here it will be sufficient briefly to refer to one or two salient points, for instance:—that by some well-known and important Companies the eyesight of men discharging the highly responsible duties of engine-drivers and firemen is tested by clerks or other non-professional persons who have no scientific knowledge of the subject; that, as a consequence, the importance of testing each eye separately is not appreciated; that the tests differ so much that a man rejected by one company may be accepted by another; that men who have passed the tests of an important railway company have voluntarily resigned, confessing that their sight was unequal to the requirements of engine driving, though they could still pass the official test; that on fifteen English railways, on nearly all the Scotch, and on more than half the Irish, the colour-sense is tested simply by asking the man to name the colour of the object shown to him, a test which is quite inadequate, inasmuch as colour-blind persons can sometimes name colours correctly under certain conditions of luminosity, although unable to distinguish them under other conditions, and which may indeed be worse than useless, in as much as it may licence and thereby reassure a candidate who previously doubted his ability to see colours properly; that the arrangements for re-examination of the eyesight during the period of service are very imperfect; that no efficient steps are taken to investigate the eyesight of those who have been concerned in the occurrence

of accidents on the railway; and, lastly, that there is no sufficient guarantee against visual defects in the examiners themselves—the case of a colour-blind examiner is not unknown to the committee.

The appendix to the report gives details of the tests which are employed on a large number of railways in this and other countries.

The following are the recommendations of the committee:—

1. That all candidates for railway service—certainly all those applying for duties connected with the safe-conduct, signalling, and moving of trains—should undergo an examination in eyesight.
2. That the examiners in all cases should be qualified medical men. To ensure that these gentlemen are not themselves colour-blind, and that they are familiar with ophthalmic work, the Committee suggests that no railway company should appoint an examiner except on the recommendation of a consulting ophthalmic surgeon, who shall certify that his nominee is in all respects well fitted for the duties of the office.
3. That the following standards of vision should be required on all the railways of the United Kingdom.

Class A. For the posts of *engine cleaner,* fireman, driver, signalman, and pointsman*, there should be required:—

In *one* eye, *normal* acuteness of vision [$v=\frac{6}{6}$ (Snellen)] and *normal* refraction.

In the *other* eye, acuteness of vision *not less than one-half of the normal* [$v=\frac{6}{12}$ (Snellen)], without glasses. Care should be taken by the examiner to determine that the condition of visual acuteness is not dependent on any latent error of refraction, *e.g.*, high hypermetropia which by becoming manifest might lead to the candidate's disqualification in later life.

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* The high standard of vision here suggested for engine cleaners presupposes that the candidate is to become eventually a fireman or driver, and is intended to check the admission to Locomotive Departments of youths whose visual power is such as would interfere with their promotion.

In *each* eye normal colour sense. Unrestricted fields of vision.

Strabismus or any defective action of the exterior muscles of the eyeball or unhealthy condition of the eyes or eyelids should disqualify a candidate for any of the above appointments.

Class B. For all other situations in the executive service concerned in the moving and signalling of trains :—

With *both* eyes open visual acuteness of ***not less than two-thirds of the normal*** [$v = \frac{6}{9}$ (Snellen)] without glasses, provided that *neither* eye has *less than one-third of normal vision* [$v = \frac{6}{18}$ (Snellen)] without glasses.

In each eye normal colour sense, and unrestricted field of vision.

Strabismus, or any defective action of the exterior muscles of the eyeball, or unhealthy condition of the eyes or eyelids, should disqualify a candidate for any of the above appointments.

The Committee believes that the wearing of glasses is compatible with the duties required of some employés who would be included in Class B. In such cases they are of opinion that men should be encouraged to wear spectacles in order that their visual power may be raised above the standard defined for this class.

Re-Examination.

a. That in Class A re-examination of the eyes and visual power should take place on each promotion, and also on transference of any servant from Class B to Class A.

b. That powers should be possessed and systematically exercised for re-examining railway servants at approved intervals, and otherwise as may appear desirable.

E.g., after each neglect or act which may be attributed to defective sight, especially such as are connected with accidents (collisions or derailments).

After every acute affection of the eyes or lids.

After serious accident, especially those which could cause concussion of the brain, and after diseases of the brain in general.

After the diagnosis of diabetes mellitus, or albuminuria, as well as secondary syphilis.

In general on the recommendation of the railway surgeon or the medical man who has been treating the person.

The following general rules should also be enforced :—

1. That each eye should be tested separately for colour sense as well as for form sense.
2. That the test for colour sense should be that of Holmgren, carried out in strict accordance with his directions. After this test has been passed the candidate should be required to recognize and name promptly the colours used in signalling. We wish to emphasise the importance of employing glass of standard colour in railway signal lamps ; as recommended by the Committee of the Royal Society.
3. That the test for form sense should be carried out by means of Snellen's type, and in accordance with his published instructions.
4. Any employé on a railway reported to be disqualified for any service on account of defective eyesight shall have a right of appeal to the consulting ophthalmic surgeon of the line on which he is employed, whose decision should be final.

In an appendix to the report we find a copy of the questions which were addressed to the managers of all the railways in the United Kingdom and a full tabulated statement of the information received in reply. Full details are also given concerning the regulations as to eyesight tests in foreign railway services.

These two reports represent the expenditure of a very great amount of labour and scientific skill freely given for the benefit of the public, and will be welcomed with gratitude by everyone who is able to appreciate their value and importance.

P. S.

Gifford (Omaha). **Further Experiments on the Lymph-streams and Lymph-channels of the Eye.** *Archives of Ophthalmology, April,* 1892.

In this paper Gifford publishes an account of experimental investigations carried on by him during the past six years. Records of former experiments appeared in the *Archives* in June, 1886, and an abstract of that paper was published in the Ophth. Rev. for July of the same year. In reviewing the present paper, we shall follow the arrangement and give the headings adopted by the author; frequently quoting *verbatim* from the original.

Methods.—For observing the transportation of pigment granules by the lymph currents, india-ink and cinnabar (in suspension in ½-¾ % solution of sodium chloride) were injected. The former causes greater reaction than the latter, but its particles reach finer channels. Injections into the vitreous were made both through a scleral incision and through the puncture of a hyoodermic needle alone. Injections into the anterior chamber of the living rabbit were made by the method described by the author in 1887*, in which an incision is made through the ciliary body into the posterior chamber, and through this aperture the needle or canula is passed by way of the pupil into the anterior chamber. For *post-mortem* injection of the anterior chamber, asphalt chloroform, 15 %, or a solution of alkanet in turpentine gave the best results. In nearly all instances albino rabbits were used for experiment.

Experiments on living animals with Ferro-cyanide of Potassium. — Twenty-eight experiments were made by injecting a solution of this salt into the eye, and precipitating it by placing the eyeball after removal in a ferric chloride solution, according to the method of Memorsky. In twenty-four the injection was made into the vitreous ; in four, subcutaneously. The results were in the main corroborative of those obtained by Ulrich, which led him to conclude that

* Trans. Internat. Med. Congress, 1887.

the aqueous, in passing from the posterior to the anterior chamber, does not go through the pupil, but traverses the iris tissue. The blue line (of the precipitate) passing through the iris root, and which Ulrich considered an indication of a constant and an important stream, was found by Gifford in a large proportion of, but not in all cases. Ulrich thought that some of the fluid from the posterior chamber passes through the iris into Fontana's spaces, without entering the anterior chamber, and Gifford confirms this opinion, and goes further in stating that a part of the stream (as indicated by the blue line of precipitate) passes from the zonula through the ciliary body into the inner layers of the sclera, so far back as not to touch the posterior chamber, nor even the front half of the ciliary body.

The blue lines are sometimes found passing through the iris, half-way down towards the pupillary margin, and in other instances, three or more lines in different parts of the iris. The course and direction of these lines may show numerous variations without any easily ascertainable cause.

In the central canal of the optic nerve, Gifford occasionally found a blue line extending backwards into the orbital tissue.

In the few cases of subcutaneous injection of ferro-cyanide, the appearances described by Ulrich were twice present. The blue line in the iris was nowhere sharp and distinct, but there was a diffuse blueness of the iris root; in many specimens the appearances suggested that the solution had been soaked up from the aqueous by the anterior surface of the iris.

As regards the blue colour in the cornea, the evidence was in favour of the solution having penetrated by way of the tissues of the sclero-corneal junction, and to a very slight extent, if at all, through Descemet's membrane.

Gifford, although obtaining results by the injection of the ferro-cyanide solution in living animals agreeing in most respects with those of Knies, Weiss, and Ulrich, interprets the facts very differently, and is convinced that this method, as used by the above-mentioned investigators, is practically useless in determining the normal lymph stream.

Injections of Ferro-cyanide into the Vitreous of Dead Rabbits.—Twelve experiments were made; the animal having been chloroformed till the last sign of life had been gone for from five to ten minutes, a few drops of the solution were injected into the vitreous either by puncturing with a hypodermic needle, or through an incision in the sclera. The animal was kept in an oven at blood heat for an hour, and then the eyeballs removed and hardened in tincture of ferric chloride diluted with alcohol. In six cases, Ulrich's and Knies' lines in the iris and cornea were as well marked as in any cases of *ante mortem* injection. Ulrich's objection that even in the dead eye the pressure in the vitreous might force the ferro-cyanide through the iris root was met by making a scleral incision more than one centimetre in length, and then injecting the ferro-cyanide solution; in these experiments, and in one in which about one-third of the vitreous was scooped out, the blue lines were generally well marked. The retina and sclera were often blue throughout, and the central canal of the optic nerve contained a blue precipitate more often than in the cases in which injections were made *intra vitam*.

Gifford concludes, from these two classes of experiment, that although the blue lines obtained by the ferrocyanide method may to some extent be determined by vital processes, there is no evidence to show that they certainly follow the paths of normal lymph-streams. They occur equally in the dead and living eye, and in the latter are subject to so much variation, and are so devoid of any histological basis, that their physiological importance is open to serious doubt. In many parts of the eye these lines appear under conditions which render it impossible that they mark the course of lymph streams. It is also unreasonable to suppose that the ferro-cyanide would diffuse through the tissues in these sharply-defined lines without any histological basis. Sometimes they are found in the neighbourhood of established lymph-channels, as, for instance, along the blood-vessels passing through the sclero-corneal junction, but it is impossible to say whether the solution has reached these localities by simple diffusion, or by following some lymph-stream.

In most cases, however, these blue lines undoubtedly

represent the boundary between the area into which the ferrocyanide has diffused and that which is still free from it.

It can be demonstrated that there is an uncommonly strong precipitation of the blue salt along such a boundary. The rather constant blue lines found in the iris root are probably due to the proximity of this structure to Fontana's spaces, through which all the aqueous has to pass, and with which its meshes freely communicate. Diffusible salts also undoubtedly pass through the iris to some extent from the posterior chamber, and it is probable that when subcutaneous injections are made, some of the salt passes through the walls of the blood-vessels into the iris tissue.

Experiments with subcutaneous injections of Fluorescein. —Five such experiments were made, and the results corresponded closely with those of Ulrich. The fluorescent line which appears in the anterior chamber, Gifford thinks, undoubtedly begins at the upper periphery of the chamber. He accepts Ehrenthal's explanation of this vertical line, described by Ulrich, which is that it is due to the force of gravity acting upon the fluorescein which diffuses into the periphery of the anterior chamber from the blood-vessels around it. The line can be produced with equal facility in the dead or living animal, and probably is little, if at all, influenced by lymph-streams.

Injections of Fluorescein into the Vitreous of Living Animals.—This experiment was tried mainly in consequence of the statements of Pflüger, Schœler, and Uhthoff that fluorescein injected into the vitreous does not reappear in the aqueous. The results prove, the author thinks, that fluorescein does pass, by diffusion or otherwise, from the vitreous to the aqueous.

Introduction of Small Quantities of Pigment into the Chambers of the Eye, and into the Cranial Cavity in Live Rabbits.—This method, Gifford thinks, gives the most reliable information as to the paths and directions of the lymph-currents, although it has more decided limitations than was at first supposed. In his earlier investigations he thought that the discovery of considerable pigment in a lymph channel, without evidence of the aid of leucocytes in carrying it there, necessarily meant that it had been trans-

ported by some regular stream. In some channels, however, he has found that the pigment finds its way equally well in precisely opposite directions. In the lymphatics surrounding the small blood-vessels of the optic nerve, india-ink passes from the large canal of the retinal vessels towards the periphery of the nerve and into the intervaginal space; it will also pass equally well from the intervaginal space, through the pial sheath towards the central canal of the nerve, but in this direction the author has not seen the pigment pass more than half-way from the periphery to the centre of the nerve. Pigment will pass from the peri-choroidal space, along the lymphatics surrounding the venæ vorticosæ to the space of Tenon, but it will also pass at least for a short distance from the latter space inwards. These facts support Leber's contention that great caution should be exercised in drawing conclusions from the presence of pigment in any tissue as to the method of its transport.

The absence of pigmented leucocytes is no proof that they may not have been instrumental in carrying pigment granules. These cells may take up pigment particles, carry them for a certain distance, and then give them up; at all events, we do not know positively that this does not occur. On the other hand, pigment might be carried by a lymph stream for some distance and then taken up by leucocytes. In the smaller channels it is, however, probable that there is either no regular current, or so slight a current that it may be stopped or even reversed by very slight variations in pressure, such as may accompany movements of the eye; so that pigment finds its way through all these finer channels, as it would through the interstices of a loose sponge, if the latter were gently moved in a fluid containing pigment in suspension. In such channels as the central canal of the optic nerve so much more pigment is carried in one direction than the other that there is justification for saying that the stream flows in a certain direction; even where this is uncertain, the pigment method is valuable, as the pigment granules, whether carried by leucocytes or not, point out the open channels; and it is not open to the objection which always obtains in injections in the dead animal, viz., the possible formation of false passages.

Introduction of Pigment into the Cranial Cavity.—The experiments under this heading have developed nothing new as to the passage of pigment from the cranial cavity to the eye, which almost invariably occurs; but they have led to some modification of the views held by the author regarding the lymph-current between the intervaginal and perichoroidal spaces. He had previously failed to get pigment to pass from the intervaginal to the perichoroidal space, although he had seen anthrax bacilli do so; he had concluded that this was the normal course of the lymph-stream, and that the pigment failed to pass because it was present in sufficient quantity to block the narrow entrance from the intersheath space to that outside the choroid. He is convinced from later experiments that this explanation is incorrect, and thinks that his own results and those of other observers indicate that, although there are open channels between the two spaces, there is not as a rule a lymph-stream through them from behind forwards.

The pigment which travels from the cranial cavity down the intersheath space finds its chief outlet into the orbital tissues around the central retinal vessels. It also penetrates the dural sheath along the smaller blood-vessels and passes forward along the surface of the sheath into Tenon's space, as far as the equator of the eye. The pigment also passes from the intervaginal space, through the pial sheath and towards the centre of the nerve, along the small blood-vessels; and at the point of entrance of the arteria centralis retinæ a small amount finds its way into the nerve and passes towards the eyeball, although the main current is out into the orbit. In the orbital tissue below the nerve there is no strong current towards the cranial cavity, as the author suggested in his former paper, nor does he agree with Deutschmann that there is a main current towards the floor of the orbit. He thinks that the pigment which escapes from the intersheath space into the orbital tissues becomes pretty evenly disseminated in the loose tissues, and perhaps from the force of gravity tends more downwards than in other directions.

Introduction of Pigment into Tenon's Space.—These

experiments showed that in the rabbit there is no proof of a decided lymph-stream in either direction ; in man such evidence as is available points rather to a movement of the subconjunctival lymph forwards. India ink introduced under the rabbit's conjunctiva passes backward and forward equally ; in man the blood from slight hæmorrhages near the retrotarsal folds passes regularly towards the cornea, in some cases entering the transparent tissue of the cornea for fully a millimetre from its margin.

Introduction of Pigment and of Anthrax Bacilli into the Vitreous.—When anthrax bacilli are introduced into the vitreous, they regularly pass out through the central canal of the optic nerve and into the various channels connected therewith. Gifford has never seen them pass forwards into the posterior chamber, although in one experiment they were found halfway through the zonula. In 35 cases pigment was introduced into the vitreous, and in all except one, part of the pigment was carried into the orbital tissues by way of the central canal of the optic nerve. In one rabbit, killed about 30 days after the injection, an unusually large quantity of India ink had passed along the vessels branching from the central retinal vessels to the choroid, so that the whole perichoroidal space, as far forwards as the ciliary processes, was full of free pigment. From this space the pigment had passed along the venæ vorticosæ to Tenon's space. In two instances, in which the rabbits lived four or five weeks after the injection, the pigment passed from the perichoroidal space forwards to the ciliary processes, and backwards for a short distance into the intersheath space. It also enters the sclerotic, but whether with or without the aid of leucocytes could not be satisfactorily determined.

In all the cases some pigment remained in the vitreous, mostly in clumps on the surface of the retina, either free or in leucocytes. When free, no tendency to penetrate the retina was evident, but when pigmented leucocytes were present, some of them could generally be seen entering the retina. In only two instances did pigment in any quantity reach the space between the retina proper and its epithelial

layer; in one the pigment was carried in by leucocytes, close to the ora serrata, spreading thence in the space mentioned; from this space the pigment penetrated the retina proper at various points, but none passed through the epithelial layer into the choroid. In the other the pigment found access to the intra-retinal space, along a small branch of the central retinal artery in the optic nerve near the disc.

Regarding the passage of pigment forward around the lens, in a number of cases, in which the animal was killed five or six days after the injection, no pigment could be seen to have passed through the zonula, while its passage into the optic nerve was well marked. But when the rabbit was allowed to live for one to four weeks, there was almost invariably a considerable passage of free pigment, occasionally only partly, but generally completely, through the zonula into the posterior and thence to the anterior chamber. Here it was partially taken up by the anterior iris surface, but mostly found its way into Fontana's spaces. More pigment was always found in the zonula and in the posterior and anterior chambers below than above. Generally less pigment was present in the posterior chamber than in Fontana's spaces. In many instances a layer of free pigment granules, with few or many pigmented leucocytes, was found at the lower part of the anterior chamber; some of these pigmented cells were often found penetrating the iris root, not in the direction of the angle of the chamber, but further back towards the ciliary body.

A thin layer of pigment is commonly found in the surface cells at the bottom of the posterior chamber, but there seems to be no tendency for it to pass deeper into the iris, either at the root or elsewhere. The writer disagrees with Ulrich as to the permeability of the iris to suspension fluids from behind and from in front; Gifford holds that the anterior surface is much the more permeable for solid particles; Ulrich finds it difficult to understand why this should be. Gifford found that the pigment from the vitreous on its way to the anterior chamber passes over

the posterior surface of the iris, but this is so comparatively smooth that it is not taken up in anything like the quantity that it is by the crypts on the front surface, and the meshes communicating with the spaces of Fontana.

J. B. L.

(*To be continued.*)

Rohmer (Nancy). **Resection of the Optic Nerve after De Wecker's method in Sympathetic Ophthalmia.** *Ann. d'Oculist., April*, 1892.

The operation of resection of the optic nerve was done on the right eye of a man, 48 years of age, whose vision had been gradually failing for six years ; the left eye was already inflamed, presenting slight pericorneal injection, a misshapen iris, and tenderness. The right internal rectus muscle was divided, the optic nerve drawn forwards on a strabismus hook, and divided as far back as possible. By rotating the eye outwards the part of the nerve attached to the globe was removed level with the sclerotic. The globe was replaced, and the muscle sutured ; the part removed was 6 mm. long. The immediate effect of the operation was slight protrusion of the eye. In two days' time the condition of the left was improved ; the tenderness and injection of the globe had disappeared, and there was less dimness ; but this improvement was only temporary. Nine days after the operation there were muscæ, inequality of pupils, and turbidity of the vitreous. Six days after, in consequence of increased inflammation in both eyes, the right was excised. This again produced a slight improvement in the condition of the sympathizing eye, but there was eventually a recurrence of inflammation, which was only stopped by performing iridectomy. Vision was finally reduced to $\frac{1}{4}$.

After Deutschmann had demonstrated the transmission of the infection by means of the lymphatic sheaths of the optic nerve, Schweigger thought that a resection of the nerve and of its sheath would interrupt the path of the infectious elements ; he therefore removed a portion of the

nerve, and cleared the whole of the posterior surface of the eye. A similar operation was performed by Pagenstecher.

This operation sometimes led to great protrusion of the eye in consequence of hæmorrhage from the divided nerve. In his modification of Schweigger's operation, De Wecker simply removed a portion of the nerve, and by using compress-scissors crushed the nerve, and prevented hæmorrhage from its central artery.

The results of resection of the nerve have shown that it is not preventive of sympathetic ophthalmia. Trousseau, Pflüger, Clausen, and Schweigger have each published cases in which resection of the nerve was followed by sympathetic mischief in the other eye.

In the author's opinion this want of success may be explained by the existence of other lymphatic channels between the two eyes.

On the other hand, enucleation prevents the onset of sympathetic troubles ; as a means of treatment of sympathetic irritation, it is almost always curative ; very often it stops the milder cases of sympathetic ophthalmia, and in the more severe cases it has sometimes brought about a cure.

W. T. HOLMES SPICER.

DE LAPERSONNE (Lille). Tubercular Disease of Lacrimal Gland. *Arch. d'Ophtal., April,* 1892.

Our knowledge of the pathological anatomy of all diseases, especially tumours, of the lacrimal gland is very imperfect. The majority of records are those of sarcoma of the gland ; a few instances of "cylindroma" have been published. The reports of adenomata, adenomyomata adenochondromata of this gland are too old or too incomplete to be seriously taken into account. In the case under consideration, the author thought he had to deal with a sarcomatous tumour of the lacrimal gland, but histological examination showed the gland to be almost

completely converted into a degenerating tuberculous mass. The absence of records of similar cases induced De Lapersonne to publish the report of his case, although the notes are imperfect in some particulars.

The patient was a female, 32 years of age, who came under observation in April, 1889, complaining of some difficulty in the movements of the right upper lid, which had existed for about three months. A small growth had been noticed near the upper outer margin of the orbit for one month. There had been no pain; the vision of the right eye was unimpaired.

The right upper lid was scarcely more prominent than its fellow; on palpation a small tumour could be felt deeply; it was not adherent to the skin, and was moulded in outline by the shape of the eyeball. The growth did not quite reach the external angle of the orbit outwards, nor the midline of the orbital margin inwards. It was adherent to the edge of the orbit and dipped into the lacrimal fossa, so that its posterior limit could not be felt. Its consistence was like that of fibrous growth, its surface irregular, but distinctly lobulated in parts.

That the case was one of disease of the lacrimal gland was evident, but the question as to the nature of the disease was less easy to decide. Three facts seemed of importance in diagnosis: the fibrous feel of the tumour, the lobulation of its surface, and its rapid course. Excluding all inflammatory affections of the gland, the author came to the conclusion that he had to do with a rapidly-growing sarcoma.

The patient's health was good; she had no hereditary taint and had not had syphilis. Five years before she had suffered from some lung affection, called chronic bronchitis, during which she had repeated hæmoptysis, some fever, and rapid emaciation. She completely recovered, and had never since suffered from cough. There were no physical signs of disease, save some harsh breath-sounds at the apex of the left lung.

The tumour was removed on May 9th through an incision along the eyebrow. It was adherent to the periosteum in the lacrimal fossa of the frontal bone. The

growth after removal was the size of a large almond, hard, with a granular lobulated surface and a pink colour. The microscopic appearance so fully conformed to De Lapersonne's diagnosis of sarcoma that no inoculation experiments were made. The patient was in perfect health twelve months after the operation, and there had been no suspicion of local recurrence.

The histological examination of a portion of the tumour was made by Professor Hermann, and his report runs, briefly, as follows:—On section the consistence of the gland seemed considerably increased; on the cut surface were seen some rounded elevations with a lardaceous appearance, and measuring up to 4 mm. in diameter. A thin capsule could be distinguished at the periphery. Only here and there were the characters of normal gland tissue recognisable, and at these points one could see with a hand-lens that whitish pathological growth enveloped and invaded the acini. In microscopic sections stained with picro-carmine the yellow-coloured new growth greatly preponderated over the red glandular tissue.

In parts less affected the glandular acini with narrow lumen were distinguishable, and also excretory tubules with cubical or cylindrical lining epithelium. Between and among these normal gland structures, and masking them more or less, extended a laminated tissue, filled with embryonic cells.

In some places the gland elements were separated by masses of compact embryonic tissue, and in these were seen groups of large cells, very noticeable by their yellow colour. These cells had ovoid, clear nuclei, which stained very slightly. In some sections the normal gland elements could scarcely be recognised, having been almost entirely replaced by yellow staining tissue.

Giant cells, with the characteristic grouping of nuclei, were not numerous. The morbid tissue was almost exclusively composed of epithelioid cells. Tubercle bacilli were not found in sections of the growth.

The histological characters of the growth rendered the diagnosis of sarcoma untenable, and conformed only to the view that the disease of the gland was tubercular.

Unfortunately, the evidence which might have been obtained from inoculation experiments is wanting. The failure to detect the bacillus of Koch may be accounted for by the methods employed to preserve the tumour. The history given by the patient of previous hæmoptysis and the presence of doubtful physical signs at the apex of one lung are of importance, in view of the histological characters of the growth.

The author states that he could find no record of a similar case. MacKenzie alone refers to a "scrofulous" affection of the lacrimal gland, characterised by the age and constitution of the patient, the slowness of growth, the absence of pain, and the lobulated shape of the tumour. The condition, he thought, was sometimes stationary, but sometimes resulted in suppuration, such as is commonly met with in scrofulous glands.

De Lapersonne suggests that his case may be very exceptional, or that it may be an instance of a fairly common, but unrecognised, condition, and hopes that evidence on this point may be forthcoming. Inoculation experiments should certainly be made in future cases of possible tuberculous disease of the lacrimal gland.

J. B. L.

VALUDE (Paris). Optic Atrophy during Pregnancy; Artificial Premature Delivery. *Ann. d'Oculistique, April*, 1892.

The case described here belongs to the same group as that described by Nettleship in the last number of the *Ophthalmic Hospital Reports*, in which the optic nerve is alone affected without retinitis. The patient, aged 30, passed through her first pregnancy without accident nine years previously. Since that time every menstrual period had been accompanied by marked amblyopia, chiefly in the left eye, which disappeared entirely after the cessation of the period. About the commencement of her second pregnancy

the left eye became affected again ; as pregnancy advanced the right eye became affected, so that finally all work became impossible, and the patient had to be led about. By the ophthalmoscope the optic nerve of the left eye was seen to be in a condition of complete white atrophy ; there was bare perception of light, and the pupil was inactive to light. The optic papilla of the right eye was remarkably pink all over, the pupil reacted to light and $V = \frac{1}{10}$. There were no other changes in the fundus of either eye.

Under these circumstances, and seeing that—

(1.) Each menstrual period brought with it transient visual troubles, probably due to slight congestions of the optic nerves ;

(2.) There was an aggravation of the symptoms in pregnancy so marked that it was impossible not to look upon the pregnancy and atrophy as cause and effect ;

it was thought advisable to bring on premature delivery. This operation was successfully performed under Professor Tarnier's directions. At this time vision was reduced in the right eye to counting fingers at four metres, and there was marked contraction of the visual field.

A fortnight after, the right papilla was less congested, $V = \frac{2}{3}$. The left eye was not much improved. After complete convalescence vision in the right $= 1$, but in the left no improvement occurred. A subsequent note says that there was fatigue, with a certain degree of amblyopia, at the next monthly period, which passed away after the cessation of the flux.

This was a case of optic neuritis with a tendency to atrophy, distinct from the atrophy associated with albuminuric and diabetic retinitis. It furnishes the proof that the cases published by Nettleship "are to be grouped rather with the optic neuritis which is sometimes seen in chronic anæmia than with any forms of neuro-retinitis caused by the retention of injurious substances in the blood."

W. T. HOLMES SPICER.

Gayet (Lyons). Restoration of the Bony Margin of the Orbit. *Arch. d'Ophtalmol., April,* 1892.

Gayet describes an operation, which he performed to relieve the deformity resulting from a fracture of the lower orbital margin, with extensive cicatrization of the overlying tissue and consequent displacement of the lower eyelid. He thinks some such procedure may be of service in the not very rare cases in which, from injury or disease, the bone at the inferior orbital margin is destroyed or displaced, and very serious deformity results from adherent cicatrices; cases which cannot be adequately dealt with by any of the usual plastic operations described in text-books.

Gayet's patient was a man *ætat.* 32, who received a blow from a piece of wood on the left cheek, just below the eye. The accident happened four months before he came under observation, and the treatment adopted at the time had been of the simplest kind; under it the superficial wounds healed rapidly.

The resulting deformity was such that the external canthus was displaced downwards and outwards by a cicatrix which was attached to the callus of a fracture, and the inner canthus widened by depression and eversion of the lower lid. Gayet came to the conclusion that nothing short of raising the depressed lower margin of the orbit would suffice to correct the deformity.

A crescentic incision was made, following fairly accurately a line of scar, and extended from the root of the nose on the left side to a point just beyond the external angle of the frontal bone, and reached as low as the level of the ala nasi. The flap thus formed was carefully dissected up, and turned back over the brow, exposing a large part of the inferior maxilla, which was found to have sustained an irregular fracture. The periosteum of the exposed bone was carefully separated, and a small useless splinter of bone removed. What the author terms the "bony incision" was then made. This was effected by a dental drill, with which a number of closely set holes, arranged in a crescent, were bored. The crescent extended from a point close to the

lacrimal tubercle of the superior maxilla to another at the outer angle of the orbit, and when completed allowed the portion of bone above them, comprising the whole of the inferior margin and part of the floor of the orbit, to be separated from the body of the superior maxilla. By raising this loose fragment from 12 to 14 mm. the soft parts could be replaced in their normal position. The loosened bone was fixed in its new situation by three small rivets of platinum, in shape like those employed in mending broken china or glass, which bridged the gap in the bones, and were driven at their lower ends into the body of the maxilla, and at their upper ends into the loose fragment. After careful cleansing of the exposed parts, including the antrum of Highmore, which had been freely opened by the drill-holes, the periosteum and soft tissues were accurately replaced and the latter carefully sutured.

The further history of the case is one of uninterrupted recovery ; and the cosmetic result was very satisfactory, although complete correction of the deformity was not obtained. It is noted as somewhat remarkable that during the operation the infra-orbital nerve was not seen, and that no loss of sensation subsequently occurred in the area of its distribution.

The paper is illustrated by two drawings showing the cutaneous and bony incisions, and the method of fixing the orbital margin in its new position.

J. B. L.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, MAY 5TH, 1892.

HENRY POWER, F.R.C.S., President, in the Chair.

A Rare Fatal Disease of Infancy, with Symmetrical Ophthalmoscopic Changes at the Maculæ Luteæ.—Mr. E. C. Kingdon (Nottingham), who read a paper on this subject, reported the case of a male child *æt.* eight months, who had been under his care. The child was born at full term, and appeared healthy until three months old, when gradually increasing weakness of the muscles of the trunk and limbs set in, so that he was unable to sit up or turn over in bed. The muscles felt flabby, but the body was well nourished. The child was apathetic, rarely cried, and the expression of the face suggested mental enfeeblement. There were no physical signs of disease in the thorax or abdomen ; no history of any previous illness, nor evidence of rickets or syphilis. The father and mother were not related, and were healthy people with good family histories. Their first child had died when two years of age with similar symptoms. At the yellow-spot region in each eye there was seen a whitish-grey patch, nearly twice as large as the optic papilla, somewhat oval in shape (the axis being horizontal), with softened edges ; a few retinal vessels were visible at its periphery. In the centre of the patch, the fovea centralis appeared as a dark cherry-red spot. There was also commencing atrophy of the optic papillæ. The changes in the two eyes were identical. The child remained under constant observation for four months, when he died somewhat suddenly. During that time the general condition had not altered. The appearances at the maculæ luteæ persisted unchanged, but the optic atrophy became more marked. Microscopic examination of the brain after death revealed manifest changes in the pyramidal cells of the cortex ; they were altered in shape, being mostly round or oval. The cell protoplasm was vacuolated, and formed an irregular shrunken mass

around the nucleus. Sections of the spinal cord revealed "descending degeneration." The examination of the eyes was unsatisfactory, owing to the retina having become folded at the macular region during hardening. Reference was made to the cases published by Waren Tay, Magnus, Goldziehr, Hirschberg, Wadsworth, and Knapp. From the close resemblance which the few recorded cases bear to each other, both in their history, symptoms, and termination, Mr. Kingdon argued that they were instances of a well-defined disease, possessing distinctive clinical and diagnostic signs. The paper was illustrated by drawings and photographs.

Symmetrical Retinal Disease in Infants.—Mr. Waren Tay reported a fourth case of symmetrical changes in the yellow-spot region in an infant, resembling those of embolism of the central retinal artery. He referred to Plate iii. vol. I. of the Society's *Transactions*, in which similar appearances were depicted. The present case, a male child aged 11 months, seemed dull and almost helpless, being unable to stand or sit without assistance, as the mother said, because he was "weak in the back." Sight appeared very defective. The eldest child of the same parents had exhibited a similar condition, and had died slowly of wasting when aged fifteen months. There were symmetrical changes at the maculæ, exactly resembling those figured and referred to, and closely simulating those due to embolism of the retinal artery; there was, however, no obvious change in the discs. There were six children in the family, three of whom the eldest, referred to above, the second, and the sixth (the patient) were dead. The second child died of diphtheria *æt.* six years. The others appeared well. The parents were first cousins. The father suffered from his heart, having had rheumatism when a boy. The mother had lost one brother by consumption.

Case of Spontaneous Cure of Cataract.—Mr. Charles Higgens communicated the case of a gentleman, aged 57, who had consulted him in February. He had seen the late Mr. G. Critchett ten years before, and was then told that he had a ripe cataract in the right eye, and as his left eye was unaffected Mr. Critchett advised him to have nothing done. He had neither advice nor treatment for his eyes, nor had he

received any injury. from that time until he consulted the author ; for $8\frac{1}{2}$ years the right eye continued to have good perception of light, and objects could be indistinctly seen at the sides but not in the centre of the field. Eighteen months ago he found the vision of this cataractous eye was improving, and he began to see objects in the middle of the field. His wife had for some time noticed a change in the appearance of the eye, which she described by saying that it looked whiter and that some of the white shook about in the pupil. On examination there was no sign of wound to be detected on the cornea ; the pupil was circular and freely movable, a good deal of opaque membrane and possibly some lens-matter occupying its area, the optic disc was visible, and vision was $\frac{6}{36}$ with a $+3\frac{1}{2}$ inch lens and Jaeger 10 at 6 inches with a $+2\frac{3}{4}$ inch lens, the whole, or nearly the whole, of the lens having undergone absorption.

Mr. Lang referred to the case of a man under his care at Moorfields Hospital, in whom a senile cataract had almost disappeared during the course of two years. The nucleus of the lens had sunk to the lower part of the capsule, leaving a central nearly clear space. With correcting glasses the man had good sight.

Vasculitis in Inherited Syphilis.—Mr. Holmes Spicer read a paper describing the condition of the retinal vessels sometimes met with in the retinitis of congenital syphilis. Ophthalmoscopic examination in such cases revealed faint white lines on each side of the vessel, beginning at or near the optic disc, and gradually increasing in thickness towards the periphery. Although both sets of vessels were affected, the change was generally more marked in the veins than in the arteries. In very acute cases the vessels were entirely obliterated or converted into white threads. This change was combined with a diffuse retinitis and with a superficial disturbance of the choroid. Microscopic examination of the retina showed that the intima was very greatly thickened in all the vessels, there was also an increase in the thickness of the outer coat ; all the elements of which the vessel wall was made up were in places dissociated from one another. The condition was similar to that described in the vessels of

the pia mater by Hubner, Greenfield and others. Cases were shown exhibiting the appearances described.

Mr. Lawford inquired if there had been any opportunity of examining the vessels of other parts of the body and referred to the widespread vascular disease met with in some cases of inherited syphilis, in which the histological changes, which were generally most marked in the arteries, resembled those described and figured by Mr. Spicer.

Scarring of the Conjunctiva from Ophthalmia Neonatorum.—Mr. Sydney Stephenson, who exhibited cases and read a description of this affection, referred to the fact that the condition was not mentioned by most writers on ophthalmology. The cicatricial changes in the conjunctiva are nearly always symmetrical, and are met with in two varieties, conveniently distinguished as the typical and atypical. In the former, which is easily recognised, a thin bluish-white scar is seen covering the entire conjunctival surface of the lower lid and the superior fornix, the rest of the upper lid escaping. In the lower lid the cicatrices run in crescentic lines, following the contour of the lid. This concentric arrangement is usually absent in the superior fornix. In many cases, although the scarring in the upper lid is limited to the retrotarsal folds, there is a minute projecting fold at the junction of the fornix and tarsus which is fairly characteristic. In the class termed atypical there are multifarious forms, the most usual being dense white scarring of the conjunctiva of the upper and lower lid and the superior fornix. In other instances a very delicate bluish-white scar was seen on the lower lid only. None of the appearances met with, at all resemble the scarring which results from chronic granular lids. The author had met with these conditions in 82 out of 15,316 school children examined, the percentage being much higher among pauper school children than among those of higher social grade. Ophthalmia neonatorum is not invariably followed by cicatricial changes in the conjunctiva; if present, they may be the only evidence of the previous disease, or may be accompanied by other results, such as corneal nebulæ, pyramidal cataract, etc.

Living and Card Specimens.—Dr. Wherry (Cambridge): Orbital Neuroma.—Mr. Doyne (Oxford): 1. Fragment of

Steel embedded in the Iris for twelve years; 2. Plugging of the Arteria Centralis Retinæ.—Mr. Work Dodd: Tuberculous Conjunctivitis.—Mr. Juler: Case of Peculiar Retinal Changes.—Mr. Brailey: Colloid Degeneration of Choroid with Formation of Bone.—Mr. Marcus Gunn: Arterial Changes in Renal Disease.—Mr. Holmes Spicer: Retinal Vasculitis in Inherited Syphilis.—Mr. Sydney Stephenson: Scarring of the Conjunctiva after Ophthalmia Neonatorum.

CARL MELLINGER (Basel). **Experimental Inquiry into the origin of the Corneal Opacities after Cataract Extraction which have been lately noticed.** *V. Graefe's Archiv. Band* 37, *Ab.* IV.

Since the extraction of cataractous lenses has been carried out persistent corneal opacities have been noticed to occur after the operation ; these were generally caused either by a purulent injection of the wound or by lengthened absence of the anterior chamber, with consequent synechia anterior. Soon after the introduction of cocain into ophthalmic practice a new and hitherto unknown form of persistent opacity was seen, and its cause has not yet been determined.

Bunge (*Klin. Monatsbl. f. Augenheilk.*, 1885, *p.* 402), besides noticing that during cocainisation circular defects in the corneal epithelium sometimes occurred, reported six cases of parenchymatous opacity of the cornea occurring after cataract extraction. This opacity resembled "striped keratitis," and was only faintly visible eight days after the operation, but gradually increased in intensity ; the surface of the cornea over the opacity was irregular. Bunge ascribed these changes to the use of cocain. After him many other surgeons published their experiences, and Wicherkiewicz suggested, from his experience in a case where a strong sublimate solution (1.1000) had been used in error, that the opacity was caused by the use of corrosive sublimate.

Pflüger (*Klin. Monatsbl. f. Augenheilk.*, 1886, *p.* 169) described some cases which resembled those of Bunge ; he believed the opacity to be caused by cocain, but to be predisposed to by bad nourishment, and a large corneal wound. He observed one case occurring after an iridectomy. Wicherkiewicz, at the Heidelberg Congress in 1887, described three more cases of persistent corneal opacity after cataract extraction, which he ascribed to the use of cocain, believing that its use caused prolonged low tension in the eyes operated on, and prevented good coaptation in the edges of the wound.

Meyer thereupon mentioned that he had several times seen, after the injection into the anterior chamber of eserin and pilocarpin made up with weak sublimate solution, such opacity of the cornea as to prevent the pupil from being seen. This, however, cleared up completely in about eight days.

In 1888 at Heidelberg, at the International Congress, Knapp stated that he had found that even very weak corrosive sublimate solutions (1.10000, 1.5000) introduced into the anterior chamber caused corneal opacities, which were in some cases persistent; these lotions were used for the purpose of washing out the anterior chamber after cataract extraction.

Würdinger made experiments in animals, and found that continued use of cocain in rabbits' eyes where they were kept open caused roughness of the epithelium and thinning of the corneal substance. When the lids were kept closed the roughness was not so marked. When fluorescin was used in these eyes, almost the whole substance of the cornea was stained, showing that the cocain had made the epithelium permeable. When the eyes kept open during cocainisation were irrigated with antiseptic lotions, temporary opacity, confined chiefly to the epithelial layer, took place.

To account for Bunge's cases, Würdinger irrigated with a 1.5000 cor. subl. lotion the eyes of a rabbit, in each of which a large corneal flap was made, but the section left uncompleted as in a sclerotomy; one of these eyes had been previously anæsthetised with a 5 per cent. solution of cocain; two days later the animal was killed and the eyes examined. In both cases there was so-called "striped keratitis" round the wounds, but this was more marked in the eye in which cocain had been used. Würdinger concluded that the cocain was the chief cause of the change, the action of the sublimate being of less importance, and that the cocain acted by making the epithelium permeable, and by causing the parenchyma to become deficient in lymph. The cases of "striped keratitis" which he observed after cataract extraction cleared readily under a gutta-percha sublimate bandage.

In the clinic at Basel these parenchymatous opacities after cataract extraction were also observed; they were sometimes permanent, were generally striped, and were grey or milky-white in colour.

When only a 2 per cent. solution of cocain was used with moderation, the wound being constantly irrigated with a 1.5000 solution of corrosive sublimate, they still occurred. They cannot, therefore, have been caused by drying of the cornea ; and the bandage always used was just that recommended by Würdinger as a cure for that form of keratitis, yet this did not prevent their occurrence : so that these cases were analogous to those described by Bunge, Knapp, and Pflüger, and not to those which Würdinger had treated with success. The cases were six in number, and a full account of them is given. In all the opacity was more or less permanent ; no common cause for the occurrence of the keratitis can be found by examining the notes of the cases. Collapse of the cornea and difficult delivery of the lens is perhaps the most striking point which they have in common, and this might suggest that the keratitis was caused by mechanical injury to the endothelium in clearing the anterior chamber of cortical masses, or by the use of instruments. This, as Leber and Wagenmann have shown, causes a circumscribed diffuse corneal opacity ; but that this is not the cause in the author's cases is seen by the facts : (1) that the keratitis extended over the larger part of the cornea ; (2) that these opacities were unknown in earlier series of extractions, though the endothelium was in them exposed to the same chance of injury ; and (3) that when sublimate solution was no longer used for irrigation purposes, the keratitis no longer occurred.

It was noticeable that the opacities only occurred after cataract extraction, though both cocain and corrosive sublimate were largely used in other operations, and it seemed probable, therefore, that the wide opening of the anterior chamber had something to do with their production ; the author therefore made experiments to find out : (1) what effect cocain, or cocain with sublimate, had on the unwounded cornea ; (2) what effect they had when the anterior chamber was opened ; (3) what effect they had on the cornea when injected into the anterior chamber. Rabbits were the animals experimented on.

The results were briefly as follows :—

1. As to the effects on the unwounded cornea, Wür-

dinger's results were confirmed; that is to say, the cocain caused roughness of the epithelium and made it permeable to colouring matter (uranin 20 per cent. was used), and when a cocainised eye was irrigated copiously with 1.5000 corrosive sublimate solution, a temporary surface opacity was caused; this, therefore, was a negative result, as this opacity did not resemble that observed after cataract extraction.

2. As to the effect on the cornea when the anterior chamber was opened it was found that a 2 per cent. solution of cocain dropped into the eye every five minutes for one hour caused nothing but a slight temporary milkiness of the wound edges, and slight temporary roughness of the epithelium; the wound made was about 1 mm. in length, or a little longer. Eyes in which a similar wound was made were then, after cocainisation, irrigated for 10 minutes with a 1.5000 solution of corrosive sublimate, the aqueous being let off from time to time during the irrigation; this only caused a superficial haziness of the cornea, which in one or two days passed off completely. It was also observed in all these experiments that a lengthened irrigation with sublimate solution caused a catarrhal conjunctivitis in rabbits' eyes which lasted for several days. The results in this series were therefore also negative.

3. As to the effect of cocain or corrosive sublimate injections into the anterior chamber, various experiments were made. (*a.*) A flap 1¼ mm. in length having been cut in the cornea, a 2 per cent. cocain solution was injected with a syringe into the anterior chamber; many eyes were thus treated, but in none was a parenchymatous or permanent opacity produced. (*b.*) Corrosive sublimate solution 1.5000 was injected into a number of eyes, and also a mixture of the cocain and corrosive sublimate solutions. Some of these eyes were previously cocainised and some not; in all the result was the same, a parenchymatous keratitis lasting from three to six days was produced; this keratitis resembled that seen after cataract extraction, but differed from it in clearing up completely. In these injection experiments, however, owing to the size of the incision, the fluid injected flowed out of the anterior chamber so easily that probably none of it was

retained there. Now after a cataract extraction, owing to the very low tension, especially when cocain is used, it is probable that fluids introduced into the anterior chamber remain in it, and to observe the effect of this, the following experiments were made. (*c.*) The cornea was perforated and some 1·5000 sublimate solution injected after the aqueous had flowed off; the solution remained in the anterior chamber after withdrawal of the syringe. This was found in every case to produce a parenchymatous opacity similar to that observed in human eyes after cataract extraction, which was in many cases a permanent one; the corneal wound had nothing to do with its production, as when injected from the sclerotic the solution had the same effect. Solutions of cocain similarly injected into the anterior chamber had no effect in producing an opacity. Experiments were also made with cocain which confirmed Würdinger's statement that muriate of cocain makes the corneal epithelium more permeable to staining fluids.

From all this the author concludes that—

1. A solution of corrosive sublimate 1.5000, if present for a short time in the anterior chamber, produces a parenchymatous opacity of the cornea, and if any of the solution remains in the anterior chamber a permanent opacity may result.

2. Cocain alone produces no corneal opacity, but by its presence in the anterior chamber increases the effect of the sublimate solution by making the endothelium more permeable; its use also by lowering the tension of the globe and favouring the collapse of the cornea tends to cause the retention in the anterior chamber of the solutions used at operations.

Clinically, this sublimate keratitis in rabbits' eyes resembles exactly that observed in the human eye after cataract extractions where sublimate is used; they are almost certainly identical.

If sections of the opacity, when recent, are examined, the cornea is found to be thickened, the lymph channels enlarged, and the corneal cells increased in number. This increase is, the author believes, only apparent; the endothelium is absent in specimens examined during the first

eight days or so; no noticeable infiltration of cells from the neighbouring parts was ever seen; pathologically, in fact, the opacity resembled that described by Leber (*v. Graefe's Archiv. XIX. p.* 181) as occurring after wounds of the corneal endothelium (*Quellungstrübung*).

When the opacity has become permanent the cornea is found to be no longer thickened; the epithelium, the endothelium, and membrana Descemeti are normal, but there are more corneal corpuscles to be seen in the opacity than in the transparent parts, and the corneal fibres are displaced, resembling rather the fibres of the sclerotic.

Even weak solutions of corrosive sublimate produce these opacities (1.10000, 1.15000); but a 3 per cent. solution of boric acid, or a ½ per cent. solution of sodium chloride, can be injected into the anterior chamber without any bad result, even when cocain is used with them.

Other fluids, as distilled water, weak acids, alcohol, and especially the aqua chlorata recommended as an antiseptic by Schmidt-Rimpler, produce opacities of various degrees of density and permanence when injected into the anterior chamber of a rabbit's eye. In the last 100 cataract extractions at Basel there have been no cases of corneal opacity, all the irrigations and washings out of the anterior chamber having been performed with boric acid solution.

W. G. T. Story.

Th. Leber (Heidelberg). **On the Concurrence of Disseminate Choroiditis with Hæmorrhagic Retinitis or Retinal Hæmorrhage in the same Eye.** *Article XII. in the Helmholtz Festschrift.*

To what extent are diseases of the choroid separable, as regards their causes and their occurrence, frcm diseases of the retina? The article before us is an important contribution towards the understanding of this intricate question. The author points out that the isolation of the retinal blood-supply from that of the choroid gives a certain independent character to the inflammatory changes which are met with in each of these two tunics respectively; and that when disease in the one involves the other also, the changes in the latter must often be regarded as secondary. Moreover, clinical experience shows that the etiology of inflammatory processes in the choroid is in general somewhat different from that of retinal inflammation. Thus, while retinal inflammation with multiple hæmorrhages frequently depends on disease of the heart and blood-vessels, patchy inflammation of the choroid is commonly connected with syphilis.

Diseases of the choroid and retina, apart from those caused by injury, are, however, alike in this—that they are commonly produced by agents conveyed to the eye from within the body by the circulation of the blood. Our knowledge of such agents is still very defective, but there is reason to believe that microbic irritants are among the most important of them, and this is especially probable in those cases where the inflammation presents itself in the form of many distinct foci occurring simultaneously or in quick succession. Such multiple foci indicate the presence of numerous separate agents, each exercising its toxic power over a limited area, and may reasonably be referred to a scattering of micro-organisms throughout the tissue; the presence in the blood of a soluble irritant would presumably cause more evenly diffused changes.

The conveyance of microbes into any vascular region produces changes which vary, probably, not only with the nature of the microbes themselves, but with the anatomical character of the invaded tissue; in short, like causes induce unlike effects in different parts.

Micro-organisms suspended in the blood-stream must, before they can damage the tissues, be arrested in their course and adhere to the wall of the containing vessel. Their arrest is commonly promoted by their being contained in coagula or particles of broken down tissue, or aggregated in colonies, whereby they are rendered unable to traverse the finest arterioles or capillaries. They often multiply at the point where they are brought to a standstill. In certain regions where vascular anastomosis is scanty the irritant effect of the obstructed particle is supplemented by the mechanical consequences of the obstruction, namely, by malnutrition of the vessel wall and surrounding tissues, venous hyperæmia, diapedesis of red corpuscles, and necrosis, the degree and extent of which will depend, of course, on the calibre of the blocked vessel.

In the choroid, where the arterial anastomosis is abundant, the capillaries large, and the capillary mesh-work exceptionally close, the mechanical effects of the plugging of a vessel are, no doubt, proportionately slight. In the isolated arterial system of the retina, with its finer and wider-meshed capillaries, the consequences of such an accident are more important; hæmorrhages are likely to follow unless the afflux of arterial blood is cut off by a plugging of the main trunk. If to the mechanical obstruction a certain toxic influence be added, the changes in the retina will be those of a hæmorrhagic retinitis; while in the choroid, although there will be no serious obstruction of its circulation, there will be circumscribed foci of adhesive inflammation.

In support of the ideas here expressed, Leber refers to a series of cases in which, in the same individuals, hæmorrhagic retinitis or simple hæmorrhages of the retina and vitreous occurred simultaneously with disseminate choroiditis, and in which the assumption appeared to be justified that the two conditions depended on one and the same

cause. He records two instances of hæmorrhagic papillo-retinitis combined with disseminate choroiditis, and refers to several others which presented a combination of disseminate choroiditis with multiple hæmorrhages in the retina, and in some instances also with hæmorrhagic opacities in the vitreous. The amount of blood in the vitreous was sometimes very considerable, and caused accordingly much impairment of vision. These cases resembled the well-known group of spontaneous vitreous hæmorrhages in young persons : the patients were mostly between sixteen and twenty-six years of age, vision underwent rapid improvement through re-absorption of the blood, but recurrences were frequent. But whereas no changes other than those due to the retinal hæmorrhages have usually been found in cases belonging to this group, Leber frequently found extensive patches of atrophy of the pigment epithelium and aggregations of black pigment such as are usually referred to disseminate choroiditis.

When the clearing up of a considerable vitreous hæmorrhage reveals no visible change in the fundus to indicate its source, it appears reasonable to assume the presence of some inflammatory process in the ciliary body as the origin of the extravasation. But in many of the cases now referred to it was clear that the vessels of the retina were the source of the hæmorrhage ; the blood had the radiate arrangement characteristic of extravasations amongst the fibres of the retina, and in some instances opacities could be seen extending from the retina into the substance of the vitreous, while no ruptures of the retina through which blood from the choroid could reach the vitreous were discoverable.

In order to establish the supposed concurrence of choroidal and retinal disease here in question it is necessary to prove that the changes in the pigmented epithelium described above are really the outcome of disturbance in the choroid. Patches of atrophy surrounded by aggregations of pigment in this layer are commonly regarded as an expression of a choroiditis. Leber holds that this view is, in the main, correct, but he admits that such changes when limited to the pigmented epithelium may possibly be the result of a primary retinitis, and he cites certain histological observa-

tions as favouring this idea. Still, in many of the cases observed by himself, he was able with considerable certainty to make the diagnosis of an adhesive choroiditis, in some instances with sclerosis of the walls of the choroidal vessels. In some cases he noted also, in addition to the disturbance of the pigment epithelium, copper-brown spots scattered over the fundus, which he was inclined to attribute to choroidal hæmorrhages.

The changes observed in the retina and choroid respectively had not the correspondence of situation which they should have had if directly dependent the one upon the other; the retinal hæmorrhages were seen chiefly in the neighbourhood of the papilla, the choroidal atrophic patches chiefly near the periphery. Moreover there were two cases in which, while one eye showed the combination of diseases under consideration, the other showed a disseminate choroiditis without retinal changes. Several cases, again, of recurrent retinal hæmorrhage with disseminate choroiditis were complicated by slight serous or plastic iritis, a further indication of mischief in the uveal tract.

Turning now to the etiology of this combination of retinitis with choroiditis, there was no evidence of a connection with disease of the heart or vascular system, and little, if any, of syphilis. Among the antecedents and complications, rheumatism appeared to have been the commonest, and in this connection Leber makes the important statement that in his experience the relation of disseminate choroiditis to syphilis is not so pre-eminently frequent as has been generally assumed. He has lately treated non-syphilitic cases of this disease with salicylate of soda, and has obtained therewith more rapid improvement than formerly. According to this observation it may be right to class many cases of choroiditis, as we already class many cases of iritis, as rheumatic. Moreover, the recognition of rheumatism as one of the causes of choroiditis may help to explain the concurrence in the same eye of choroiditis with retinitis or retinal hæmorrhage, to which this paper draws attention.

P. S.

GIFFORD (Omaha). **Further Experiments on the Lymph-Streams and Lymph-Channels of the Eye.** *Archives of Ophthalmology, April*, 1892.

(*Continued from p.* 176.)

Introduction of Pigment into the Posterior Chamber.—Gifford's results accord in the main with those of Ulrich. One or two drops of india-ink in suspension were injected into the posterior chamber (through the ciliary body) in albino rabbits; in some the pigment appeared almost immediately, at the pupillary edge of the iris, and passed into the A.C. If eserine had been applied before the operation no pigment was visible in the A.C. for a short time, but it invariably appeared within a few hours. By microscopical examination it was ascertained that most of the pigment which did not pass forward through the pupil soon after the injection was taken up by leucocytes. Occasionally a few pigment holding leucocytes were found in the zonula or anterior part of the vitreous; it seemed doubtful whether these came from the posterior chamber or from the path of the incision through the ciliary body. With the exception of these few leucocytes, there was no evidence of any stream from the posterior chamber to the vitreous.

Introduction of Pigment into the Anterior Chamber.—This experiment was performed twenty-five times; cinnabar being used in three, and india-ink in the remaining instances. In the following particulars the results agreed with those obtained by other investigators: (1) the enclosure of more or less of the pigment in a fibrinous clot (into which pigment-absorbing leucocytes find their way); (2) the lodgment of free pigment in the depressions and superficial layers of the iris; (3) the accumulation of the greater part of the pigment, whether free or enclosed in cells, in Fontana's spaces; (4) the passage of pigment thence, into the iris-

root, inner layers of sclera and ciliary processes. From this point the conclusions arrived at by different observers vary considerably. Gifford's are briefly as follows :—Free pigment passes readily from Fontana's spaces into the blood-vessels of the sclero-corneal junction, and thence to those of the choroid and subconjunctival tissue ; this opinion is contrary to that he had formed from earlier experiments, viz., that while there was a free outlet for pigment through the perivascular lymph spaces, no pigment actually penetrated the blood-vessels. The quantity of pigment inside the blood-vessels diminishes rapidly as the distance from Fontana's spaces increases.

The pigment also passes from Fontana's spaces into the lymph spaces of the iris-root, ciliary processes, choroid, sclera, and the inner layers of the cornea, close to the angle of the anterior chamber. In the choroid and perichoroidal space pigment, both free and contained in cells, travels as far as the equator of the eye ; but the distance to which it penetrates varies according to the amount and kind of pigment used, and the length of time between the injection and the death of the animal. Pigment occasionally travels along the venæ vorticosæ to Tenon's space, but Gifford has not traced it further than about a millimetre outside the sclerotic coat.

No pigment enters the cornea through Descemet's membrane, but Gifford has always found it passing from Fontana's spaces for a short distance into the inner layers of the cornea, often in a fine line immediately in front of Descemet's membrane. Pigment is also invariably found in the epithelial cells on the posterior surface of Descemet's membrane.

Introduction of Anthrax Bacilli into the Anterior Chamber.—Four experiments gave results as follows :—A few drops of an aqueous suspension of anthrax spores injected into the A. C. of a rabbit gives rise to an abundant growth of the bacilli in 24 hours ; the rabbit dies in 48 to 60 hours. Microscopic examination shows that all the blood-vessels of the eye contain bacilli, and that Fontana's spaces are filled by them. They pass from these spaces backwards into the ciliary processes and along the perichoroidal space, for about 1 mm.

from the beginning of the choroid proper; anteriorly they penetrate the corneal tissue for a short distance, directly in front of Descemet's membrane. Gifford found bacilli in one experiment, passing in multitudes from the space of Fontana directly into the blood-vessels of the sclero-corneal junction.

In certain particulars the anthrax experiments gave results very different from those obtained with pigment. The anthrax bacilli were not found in the tissue of the iris or choroid, though present in the perichoroidal space and in the blood-vessels; the pigment was found in the tissue of both iris and choroid.

These experiments, Gifford thinks, demonstrate that there is free communication between the anterior chamber and the blood-vessels of the sclero-corneal junction; in this the results agree with those of Heisrath, and are adverse to the opinion held by Leber, that no open channel exists for the outlet of the aqueous. Gifford lays special emphasis on the fact that in living animals pigment passes readily from the A. C. into the blood-vessels of the sclero-corneal junction, showing the existence of an outlet for the aqueous, in comparison with which others must be insignificant. A small amount of the aqueous doubtless escapes by way of the choroid and perichoroidal space, as shown by the passage of pigment and anthrax bacilli; but the evidence seems to show that there is no decided current in these channels. There must, however, be some current, however slight, away from the A. C., since the pressure in the perichoroidal and sub-conjunctival spaces is less than that in the anterior chamber.

Post-Mortem Injections into the Anterior Chamber.—These experiments on the eyes of dead rabbits and sheep confirmed the results of Schwalbe and Heisrath, as opposed to Leber, that there exists a direct connection between the A. C. and the vessels at its periphery. The most successful results were obtained with low pressure injections (25 to 30 mm. of mercury) of alkanet of turpentine, asphalt chloroform, and india-ink suspension.

Gifford expresses his surprise that other observers have not noticed the connection between the anterior chamber and the lymph-spaces of the cornea and choroid. Although

Heisrath figures the passage of Berlin blue into the cornea just anterior to Descemet's membrane, he gives no description of it in the text.

The channels leading from the anterior chamber through the iris-root and into the perichoroidal space are extremely fine; they have never been injected from behind, and are more successfully injected from the A. C. when a low pressure is used.

Experiments to determine the presence of Lymph-Streams in the Cornea.—Gifford agrees with Ehrenthal, that experiments with fluorescein dropped into the conjunctival sac, do not support Pflüger's contention that there is a decided stream from the periphery to the centre of the cornea.

Effects of Fluorescein on slight Lesions of the Corneal Surface.—Superficial cuts were made in various parts of the cornea of a rabbit rendered anæsthetic by cocaine. A 2½ per cent. solution of uranin was then applied. Each cut was soon surrounded by a fluorescent border, densest in the immediate vicinity of the incision and gradually fading off; this fluorescence extended uniformly on all sides of the incision if the latter had been made perpendicular to the surface. No matter where the cut was made, there was no greater tendency for the colour to spread towards the centre than towards the periphery. If Pflüger's views are correct, the coloration should spread farthest and most quickly towards the centre of the cornea. This result has never been obtained by Gifford.

Introduction of Pigment into the Cornea.—These experiments were made to test the accuracy of a statement by Morf, that there is a corneal lymph-stream from the centre towards the periphery. Gifford injected india-ink in suspension into the substance of the cornea in one eye of a rabbit, and in the other eye pierced the cornea and scraped away Descemet's membrane at several points, subsequently injecting a few drops of india-ink into the A. C. The rabbit was killed, and the cornea examined about six weeks later. The results appeared to indicate that if there be any lymph-stream in the cornea it is not of sufficient strength to influence perceptibly the movement of pigment particles through its substance.

Summary.—Gifford summarises his results and conclusions as follows :—

(1) The ferro-cyanide and fluorescein methods are not calculated to give trustworthy results in determining the physiological currents of the eye. Many of the blue lines obtained by the former method represent merely the boundaries between tissue into which the ferro-cyanide has diffused and that containing none. The lines upon which most stress has been laid can be obtained perfectly well in the dead eye. (2) Stilling's view that there is no outlet from the vitreous forward around the lens is incorrect ; the zonula is freely permeable for solid particles. The failure of attempts to inject the anterior chamber from the vitreous is probably due to closure of the iris-angle from increased vitreous tension. It is probable that the fluid secreted by the ciliary processes, posterior to the zonula, divides into two portions, one part passing forward into the posterior chamber and thence through the pupil into the anterior chamber ; the other passing back through the vitreous and out through the central canal of the optic nerve into the tissues of the orbit. (3) There is no evidence of any current from the posterior chamber through the iris-root. Pigment-bearing leucocytes may pass into the iris from either chamber, more readily from the anterior, from which they sometimes pass through the iris into the posterior chamber. (4) There is no evidence of any current from the anterior chamber through Descemet's membrane into the cornea. Pigment particles from the aqueous are taken up by the protoplasm of Descemet's epithelial cells, not so much by the intercellular cement-substance. Experiments on both dead and living animals show a free connection for non-diffusible substances between Fontana's spaces and the circumcorneal veins. It is probable that the greater part of the aqueous leaves the eye in this way. Other finer lymph-channels lead from Fontana's spaces into the posterior layers of the cornea, into the perivascular spaces of the sclero-corneal junction (possibly), and into the sclera, choroid, and perichoroidal space. Wherever these channels communicate with spaces in which there is a lower pressure than in the anterior chamber, they must serve to some extent as outlets.

This also applies to the perichoroidal space, which, besides being connected with the intervaginal space, communicates with the space of Tenon by numerous lymph-channels surrounding the vessels and nerves which pierce the sclera. The rare instances in which a passage from the intervaginal to the perichoroidal space has been observed were probably exceptional. If there is any regular current here it is probably in the opposite direction. (5) Between the retinal pigment-epithelium and the layer of rods and cones there is a tolerably well-defined space from which pigment passes freely into the retina, but hardly, or not at all, into the choroid proper. (6) While the regular passage of pigment and bacilli from Fontana's spaces into the cornea and the progress of subconjunctival hæmorrhages in the same direction, together with the impermeability of Descemet's membrane from behind, speak for the nourishment of the cornea from its periphery, the corneal lymph-stream, if any exists, is too weak to perceptibly affect the diffusion of fluorescein or the progress of pigment particles through its tissues.

J. B. L.

C. S. BULL (New York). **Tumours of the Orbit secondary or consecutive to Tumours of the Neighbouring Bony Cavities.** *New York Med. Jour. Vol. LIV. No.* 25.

Bull points out that it is of practical importance to recognise the locality of origin of any orbital tumour, whether it be from the orbital periosteum or from the neighbouring bony cavities; because this will often decide the question of the performance of an operation as well as its nature and extent. His discussion of the subject refers to all swellings of the kind, either fluid or solid, the former containing either mucus or pus, the latter often densely gelatinous, and, except the bony tumours, always malignant.

In the *sphenoid*, so long as the pathological process is limited to the antrum of that bone, there may be severe pain in the head, or all subjective symptoms may be absent. When the process extends to the neighbouring structures, symptoms arise which point to the probability that the sphenoid bone is the seat of disease—such as blindness due to compression of one or both optic nerves, or the visible or tangible presence of a growth in the naso-pharynx, ethmoid, orbit, or skull. The entrance of the growth into the cranial cavity may occur without subjective symptoms, or with severe headache, and if its progress is very rapid meningitis or cerebral abscess will result. The ophthalmoscopic appearances are those of either papillitis or atrophy of the optic nerves, due to perineuritis and pressure of the swollen nerve sheath. In some cases the pressure on the optic nerve is exerted in the optic canal. Tumours of the sphenoid antrum may perforate the middle fossa of the skull without causing blindness, and when blindness does occur in these cases it is not necessarily due to pressure on the optic chiasm, for it may be unilateral. If an orbital tumour rapidly causes blindness starting from the temporal side of the field and leaving the region of the macula unaffected to the last, and if at the same time a growth appears in the naso-pharynx, it is probable that the tumour began in the sphenoid antrum.

A morbid growth confined within the *ethmoid cells* gives rise, either to no symptoms at all, or merely to headache. Inflammation of the mucous membrane lining these cells may be an extension of inflammation from either the naso-pharynx, the frontal sinus, the maxillary antrum, or the orbit. The ethmoid cells may be turned into a single large cavity containing a collection of mucus or pus. So long as the tumour is contained within the limits of the ethmoid cells there are either no subjective symptoms or there are paroxysmal headaches, with a feeling of heat and epistaxis. The orbital symptoms are the same as those of tumour of the orbit. The motility of the eye-ball is limited. The vision may be only slightly affected, or there may be complete blindness. The visual field may not be affected. If the tumour has entered the naso-pharynx, the mouth is more

or less open and the speech nasal. Later there is loss of the sense of smell. If the ethmoid cells are opened into by the growth there is more or less continuous dropping of cerebrospinal fluid into the nose, owing to a communication between the upper wall or roof of the ethmoid cells and fissures in the base of the skull. There may also be orbital or palpebral emphysema and hæmorrhage from the nostril on the same side. Osteomata starting from the ethmoid never tend to penetrate the cranial cavity, and their operative removal is not as a rule difficult. If, however, they arise elsewhere and involve the ethmoid secondarily their removal is usually dangerous.

Mucocele and abscess are the morbid conditions of the *frontal sinus* most likely to give rise to a tumour extending itself into the orbit. In simple catarrh of the sinus the infundibulum becoming closed the accumulation of mucus results. If this is to become an abscess there must be a second element of an infectious nature present.

In chronic inflammatory disease of the frontal sinus there may, or may not, be supra-orbital pain. If the process is confined to the frontal sinus there is no other symptom. If in addition to the pain there is sensitiveness or pressure over the frontal eminence, swelling along the lower surface of the supra-orbital margin and the inner wall of the orbit, and displacement of the eye-ball downward and outward, it is probable that the disease has extended from the frontal sinus to the ethmoid cells. If, in addition to these symptoms, there are coryza, and purulent discharge from the nostril, the nasal meatus has become involved and the diagnosis is certain. But unless these symptoms are all present the diagnosis is very difficult and almost impossible. If the first symptom of orbital complication is the appearance of a dense, hard swelling at the upper and inner angle of the orbit, along the superior orbital margin and region of the lachrymal bone, and if the growth is slow and painless, it is almost certainly an osteoma of the frontal bone, which will eventually involve the orbital plate of the ethmoid, and later the cavity of the skull.

Abscess of the frontal sinus should be treated by opening it as soon as possible, draining carefully and injecting

antiseptic solutions. The opening should be large enough to admit the little finger, with which the cavity should be carefully examined for fungoid granulations or osteophytes, and these, if found, should be thoroughly removed. A drainage tube is to be inserted and the cavity washed out twice daily, until pus ceases to be discharged. Communication with the nasal fossæ may be re-established by opening into the ethmoidal cells with chisel or trephine, or by introducing a catheter through the fronto-ethmoidal canal.

Tumours of the *maxillary antrum* may cause pain in the teeth or in the region of the infra-orbital nerve, but not until they have attained considerable size, filling more or less completely the cavity, and, by distension of its walls, causing pain through pressure on the nerve twigs. Subsequently the diagnosis may be rendered easier by projection of the anterior bony wall, or by dislocation of the eye-ball upward from protrusion of the floor of the orbit. Usually at this stage of the growth the tumour may also be present in the nasal meatus or pharynx or both. In no case is it possible to diagnose a tumour of the antrum early in its development.

E. J.

G. E. de SCHWEINITZ (Philadelphia). Diseases of the Eye. A Handbook of Ophthalmic Practice for Students and Practitioners. *Philadelphia, W. B. Saunders*, 1892.

This book, of over six hundred octavo pages, furnishes a complete and systematic treatise, not only on the diseases, but including as well the refraction of the eye and its anomalies. In such a systematic work there is little latitude for originality. The individual views of an author, his more extended and minute account of the things in

which he is especially interested can only be adequately presented at the expense of the symmetry of the work. This seems to have been carefully avoided by the author, doubtless to the profit and satisfaction of the mass of his readers, though some would have liked the author's own views and experience in greater detail.

This work is, we think, remarkable among those of its class for the fulness with which it reflects all the notable contributions to recent ophthalmic literature. The references to these are generally accompanied with the name of the writer to whom they are to be credited. Exact references to the particular article in which these several views or experiences are set forth are usually not given. Had they been included, it would have made the work as valuable to the writer and original investigator as it now is to the average student and practitioner. To those who will feel this omission, the excellent list of books and journals appended to the work will be small compensation. While we may appreciate the modesty that will not allow a writer to discriminate in the matter of references, we think it is not an unreasonable expectation on the part of a reader that in a given systematic treatise he should find some guide to the more important of its author's original contributions to current literature.

The chapters on general optical principles and normal and abnormal refraction are contributed by Dr. James Wallace. They are in the main elementary and practical, and they reflect the definite teaching and minutely exact practice which have, perhaps, gained more general favour in Philadelphia than in any other part of the world. It is advised that as a rule a mydriatic should be used for the determination of refraction, with hyperopia, up to the fiftieth year; while comparatively little is said of the ophthalmometer as a means of determining with accuracy the amount of astigmatism. We suspect that this apparent indifference to an instrument that has recently been so lauded is connected with the holding of a higher standard of accuracy in refractive work than that which seems to satisfy some of the advocates of the ophthalmometer.

One of the best chapters in the book is on the examina-

tion of the patient and external examination of the eye. The schedule here given for the order of examination is so far removed from the narrowness that threatens the surgeon exclusively engaged in ophthalmic practice that we reproduce it :—

Name and residence. Age, sex, race, married or single.

Family history: Hereditary tendencies; general and ocular health of parents, brothers, sisters, etc.

Personal history: Children, their number and health; miscarriages; former illnesses, syphilis, gonorrhœa, injuries.

Occupation, relation of work to present indisposition.

Habits and brain use, tobacco, alcohol, narcotics, sexual.

Date, mode of onset, and supposed cause of present trouble, outline of its course.

Organs of digestion, teeth, tongue, stomach, bowels.

Organs of respiration, nose, throat, lungs.

Organs of circulation, heart, pulse, blood.

Kidneys, examination of the urine.

Abdominal organs, liver, spleen.

Organs of generation, menses, leucorrhœa, uterine disease.

Nervous system: Intelligence, evidences of hysteria, hallucinations, sleep, vertigo, gait, station, tendon and muscle jerks, paralysis, tremor, pain, subjective sensations, convulsions, headaches and their position.

Eyes: Inspection of the skull and orbits (symmetry or asymmetry), lids, ciliary borders, puncta lachrymalia, upper and lower cul-de-sacs, conjunctivæ, caruncles, corneæ (oblique illumination), irides (mobility and colour), anterior chambers (depth and character of contents), vision, accommodation, balance of external eye muscles, mobility of globe, tension, light sense, colour sense, fields of vision, ophthalmoscope.

In discussing the field of vision the following table is given of the physiological limits of the colour fields, differing somewhat from the limits usually assigned them, and, we think, indicating more nearly the real average. They are determined with squares of coloured paper one centimetre

in diameter. The figures indicate the number of degrees from the visual axis.

	Blue.	Red.	Green.
Outward	80	65	50
Outward and upward ...	60	45	40
Upward	40	33	27
Upward and inward ...	45	30	25
Inward	45	30	25
Inward and downward ...	50	35	27
Downward	58	45	30
Downward and outward ...	75	55	45

The connection between ocular and nasal conditions is repeatedly referred to. Phlyctenular keratitis, it is stated, is closely connected with obstructive and inflammatory diseases of the nasal passages ; and an irritating rhinitis constantly accompanies the disorder. With reference to lachrymal obstruction, it is urged that a proper appreciation of the pathological conditions of the nasal mucous membrane is of the utmost importance. In almost every case of disease of the lachrymal sac or duct morbid conditions of the nasal chambers and of the naso-pharynx are present.

The chapter in which are grouped the principal operations is opened by some general rules for securing asepsis. The hands of the operator, after scrubbing, are placed for not less than a minute in absolute alcohol, and then, without drying, in a solution of corrosive sublimate 1.1000. The skin about the seat of operation is to be subjected to much the same treatment. The ciliary margins to be thoroughly cleansed with a 1.5000 bichloride solution. The disinfection of the conjunctiva may be accomplished by a mercuric chloride one grain to the pint. When marked conjunctivitis is present preparatory treatment for some days is called for. To disinfect instruments, the jointed and rougher ones, as scissors, forceps, etc., are to be subjected to the action of boiling water, and then placed in an antiseptic bath of absolute alcohol, or a 1.20 carbolic acid solution. Smooth cutting instruments are sterilized by dipping them in boiling water, and placing in alcohol.

Both student and practitioner will find very convenient for reference the comparative tables of symptoms as between iritis and conjunctivitis. The printing and illustrations of

the work are good, and many of the latter are entirely original. The two chromo lithographic plates are excellent, both in the selection of subjects and in the execution, with the exception of a very unsuccessful attempt to reproduce the appearances of the fundus in astigmatism, a subject that has been so often attempted with so little success that it ought to be given up, as an effect that the ordinary artist quite fails to understand. And there is the less reason for repeating the attempt because a much better representation of the appearances in question can be obtained by looking at the picture of a normal fundus through an ordinary cylindrical lens.

On the whole, the work in question is an excellent presentation of the present state of ophthalmic science and practice.

KNAPP (New York). A Contribution to the Question of Tuberculosis. *Reprint and Translation of a Paper in the Helmholtz Festschrift.*

In this paper, partly clinical, partly experimental, Knapp publishes notes of two cases of tubercular disease of the eye, from both of which inoculation experiments were performed.

Case 1 was that of a man, *ætat.* 25, who came under observation in January, 1890, with iritis in one eye, of some months' duration. There was moderate circumcorneal injection, and the iris was swollen, dirty-brown in colour, with an uneven surface and irregular pupillary margin. A number of greyish-yellow irregular nodules were visible in the iris.

Tension was normal, V. = $\frac{10}{200}$.

The eyeball was removed on January 20th ; the wound healed readily, and the patient left the hospital four days later and was lost sight of three weeks afterwards.

Immediately after removal the eyeball was opened by a meridional section. The posterior segment appeared normal ; the anterior half showed a swollen iris and ciliary body, containing a few hard nodules. No bacilli could be found in sections stained by the Koch-Ehrlich method. On the day on which the eye was enucleated bits of iris tissue were introduced into the anterior chamber of each eye of two rabbits. In one animal the iris became congested, and presented small nodules four weeks later.

In the other rabbit, on the thirty-first day, submiliary nodules developed in the right iris, and three days later in the left. These increased in size and number, and by the fortieth day they were numerous and typical in each eye. Between the forty-fifth and forty-ninth days the symptoms began to abate, and in about ten days the nodules had become flat white patches. The rabbit could see, and was in good condition.

At the point of inoculation, at the corneal margin, yellow patches and nodules had developed and the cicatrix in the left eye was bulging. A portion of iris was removed from each eye, close to the corneal scar, on the fifty-fifth day, with some of which both eyes of another pair of rabbits were inoculated. In this iris tissue Koch's bacillus was found in moderate numbers.

The iridectomy incision healed in each eye, the changes in the irides steadily receded. The rabbit was killed 236 days after the inoculation ; no tubercles were found in the eyes or any other organ.

In the second pair of rabbits inoculated with iris tissue from the first rabbit the tuberculosis ran its usual course. Tubercles appeared in the irides on the twenty-eighth day, and when the animals were killed, three months after inoculation, the irides and ciliary bodies were transformed into a white greasy mass containing caseating nodules and numerous tubercle bacilli. The internal organs were free from tuberculosis.

Case 2 is one of great clinical importance, but of equal

rarity. It was that of a female patient, *ætat.* 19, in whom tuberculosis of conjunctiva started from the wound of a subconjunctival tenotomy for squint. The patient's right eye was amblyopic and deviated strongly inwards. The internal rectus was divided subconjunctivally, and the external rectus tendon advanced. Five days after the operation the sutures were removed. A few days later the wound beneath the internal rectus tendon showed a greyish-white coating, and there was slight thickening in the region of the tendon. The coating disappeared in the next four weeks, and the conjunctival wound healed, but some redness and swelling of the conjunctiva over the tendon remained. Two weeks later there were visible over the inner half of the conjunctiva a group of glassy nodules the size of millet seeds. They were painless, and movable with the conjunctiva. The nodules closely resembled, and were considered to be, trachoma granules, and sulphate of copper was applied daily. They, however, continued to increase, and the præ-auricular gland becoming swollen, Knapp began to suspect tubercle.

Some of the granules having been cut off, microscopic preparations were made according to the Koch-Ehrlich method, and portions were introduced into the anterior chamber of a healthy rabbit. The præ-auricular gland was incised and scraped, soft granulation tissue being removed. Some of this was prepared for microscopic examination, and another rabbit's eye was inoculated therewith. The tubercle bacillus was found in some of the nodule preparations, but not in those made from the gland tissue.

The patient's eye was, after prolonged general and local treatment, completely cured.

The inoculation experiments all gave positive results, tubercles appearing on the irides about five weeks after the implantation of the granulation tissue. Subsequently portions of iris removed and examined microscopically showed numerous tubercle bacilli, and another rabbit was successfully inoculated with this iris tissue. In the course of some months the eyes were destroyed by tubercles and caseation. None of the rabbits, five months after inoculation, showed tubercles in any other organs.

The changes in the rabbit's eyes, in both series of experiments, are well shown in a number of coloured drawings, made at varying intervals after the development of tubercles in the irides.

In its etiology, Knapp's second case is almost unique, the only similar case known to the author being that of a girl operated on for strabismus by Fano. The inoculation of the wound in Knapp's case, he considers, was purely accidental, as his instruments had been sterilised. He thinks the bacilli were in the conjunctival sac and were carried into the wound by the strabismus hook. The first case is of interest in that the rabbit's eyes inoculated therefrom went through an attack of tubercular iritis and recovered. This occurrence, although not unknown to experimenters, appears to have escaped particular notice. In all the rabbits inoculated the tuberculous processes remained localised in the eyeballs, *i.e.* the seat of inoculation, no general infection by the virus having occurred.

J. B. L.

BIRNBACHER (Graz). **A New Method of Operating in Ptosis.** *Centralblatt für praktische Augenheilkunde. May*, 1892.

Birnbacher is neither quite satisfied with Pagenstecher's operation because the lid is apt to become lifted from the globe in a state of slight ectropion, nor with Panas' on account of the skin deformity remaining.

His aim is, with the least possible injury to skin, so to bring the occipito-frontalis muscle to act upon the tarsal cartilage directly, by connective tissue bands passing from one to the other, that a raising of the lid, pure and simple, without any rolling outwards or ectropion, shall be the result.

An incision is made through the skin along the whole length of the lid corresponding to the upper edge of the tarsal cartilage, which is then cleared, and pierced by three double-needled stout silk threads. The middle one of these threads lies at the highest convexity of the tarsus and the others at a distance of 7 mm. from it to right and left. The loops of thread are not knotted ; both ends of the middle stitch are carried vertically upwards under the skin, to emerge close together in the eyebrow, and the other stitches are next treated similarly, but they are caused to incline somewhat away from the vertical, so that the points of emergence of the three are further apart than the points of entrance. The three stitches are then tied over three iodoform pads, the guide as to the degree of tightness to which the stitches are drawn being that, on closure of the eyes, the upper and under lids can still touch. The skin wound is then closed with five fine silk threads. By this method, with the minimum of damage to the skin (for the points of emergence of threads are hidden among the hair of the eyebrow), one obtains several short cicatricial bands, which have little tendency to stretch, uniting tarsus to frontalis muscle.

The threads are left in, under an antiseptic dressing, for twenty to twenty-five days, after which time one can feel quite distinctly the new bands referred to.

In a case in which he operated, and of which he gives a diagram, the note before operation was to the effect that on the left side the upper lid hung down flat and without fold, and that it remained immovable on an attempt to raise the eyes ; when looking up the aperture between the lids only measured 3 mm. (on the right side 12 mm.) The operation was performed under cocaine, the stitches were removed on the twenty-second day. The notes taken at the time of dismissal state that when the patient was looking straight before her the left eyelid was raised equally with the right ; on looking upwards, rather less ; there was a slight fold in the skin of the lid, and the lids could be completely closed when desired.

WILLIAM GEORGE SYM.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, JUNE 9TH, 1892.

HENRY POWER, F.R.C.S., President, in the Chair.

Detachment of the Choroidea.—Dr. Story (Dublin) reported this case, the notes of which were read by the Secretary. The patient, a female, aged 24, gave a history of failure of sight in the right eye twelve months previously; the eye subsequently became, according to her account, so painful that she wished to have it removed. On admission to hospital the vision of the right eye was reduced to counting fingers at 1 metre. Soon after admission the pain, of which her account was evidently exaggerated, disappeared. On ophthalmoscopic examination there was found to be a large detachment of the retina extending from the margin of the optic disc downwards. No rent was visible in the retina; all over the detached portion were small, brilliant, white spots, and also larger circular and linear white patches of degeneration. The choroid coat was also detached over a corresponding area; its structure could be easily made out through the overlying retina, except where the above-mentioned patches obstructed the view. The tension of the eye was normal and there were no external signs of disease. Reference was made to a case published by the author in the Society's *Transactions* last year.

Changes in the Retina, due to long-continued Lodgment of a Metallic Chip on its Surface.—Mr. Priestley Smith read notes of the case of a lad, aged 17, who was struck in the left eye by a fragment of bell metal. When first seen (four weeks after the injury) a small linear cicatrix was

visible in the cornea close to its inner margin, behind this a black point in the iris probably indicated an aperture made by the chip. The lens was clear; the chip of metal, triangular in shape, could be seen lying on the retina some distance from the nasal side of the disc, and on a rather higher level. Its position was shown by a scotoma in the perimeter chart. The eye was free from pain or other symptoms, and vision was $\frac{6}{18}$. About four months later the foreign body shifted its position to a slight extent, its heavier end moving slightly downwards; one month later the whole chip dropped directly downwards through an angle of about 45 degrees, according to the chart. Its former position was marked by a grey opaque patch on the retina, around which was a cloudy zone bordered by a faint pigmentary discoloration. Two scotomata were now shown in the chart, the second one indicating the new position of the chip. Thirteen months after the accident the position of the foreign body remained unchanged; its surface was less lustrous than at first. On the chief arteries and veins of the retina were numerous minute shining points, looking like specks of gold-leaf. The eye remained free from pain or injection, and the lad was regularly at work. Mr. Priestley Smith thought it unlikely that the eye would remain permanently in its present quiet and useful condition. The foreign body, though aseptic in the ordinary sense, was acting surely though slowly as a chemical irritant. The question as to the possible danger of this chemical action to the fellow eye is one concerning which further information is desirable.

The President referred to the case of a man who was struck in the eye by a chip from a hammer, which remained embedded in the optic nerve for twelve years; the eye had retained perception of light, and, though liable to slight recurrent attacks of pain, had not caused sympathetic disease in the fellow eye.

Mr. Snell mentioned the case of a boy with a fragment of metal in one eye, but with retention of good vision in that eye. He thought it important in these cases to keep the patient at rest for some time after the accident, so that the chip might become firmly attached to the

retina or other tissues by the lymph which is thrown out around it.

Mr. Tweedy spoke of a man who had been under his care about ten years ago, in whom a small chip of steel had passed through the cornea and lens and had become embedded in the retina. The chip became covered over by grey lymph, and the eye remained perfectly free from pain or irritation. The lens did not become opaque, although a small linear scar was visible in it. The patient was seen at intervals for twelve months after the accident.

Mr. Critchett mentioned a somewhat similar case, which he had watched for three years. During that time the eye remained quiet, and vision was but slightly impaired.

Mr. Lang referred to a case published by the late Mr. James Adams, in vol. 1 of the Society's *Transactions*. This patient had a fragment of steel embedded in the retina, and covered by lymph. At the end of five years the eye was still free from irritation and vision = $\frac{6}{6}$.

Recurrent Keratitis Superficialis Punctata, in which the use of Cocaine aggravated the Symptoms.—This case was reported by Dr. Adolf Bronner (Bradford). The patient, a male, aged 48, first suffered from an attack in the right eye in March, 1867, and the disorder recurred every year, usually in March or April, and nearly always in the same eye. During an attack which occurred in 1885, cocaine drops were used, and the consequence was an increase in the severity and duration of the attack. In March, 1892, when the case first came under Dr. Bronner's care, the right eye was again affected, and the symptoms, which had existed for a week, subsided in five days under treatment by atropine. As a result, however, of exposure to a strong wind the left eye became affected. There was severe pain in the eye and forehead, and intense photophobia ; the lids were red and swollen, and there was much chemosis. The pupil was dilated, and over the lower half of the cornea there were 10 to 15 small white elevated spots. The application of cocaine produced two or three minutes' ease, and then the old pain returned with increased severity, all the symptoms and appearances becoming exaggerated. After the subsi-

dence of the attack the cornea was perfectly clear and free from nebulæ. Somewhat similar cases have been recorded by several German authors, and one also by Mr. Marcus Gunn in the Society's *Transactions* for 1890.

Mr. Holmes Spicer mentioned the case of a little girl aged 7 years, who had been under his care. The symptoms and appearances closely resembled those described by Dr. Bronner; except that the recurrences were less regular.

Mr. Gunn referred to two cases he had brought before the Society a couple of years ago, soon after Fuchs had published his description of this form of keratitis.

Double Optic Neuritis after Influenza.—Mr. Simeon Snell (Sheffield) read notes of two cases, both occurring in females, one aged 19, the other $13\frac{1}{2}$. In each case failure of sight came on a few weeks after recovery from an attack of influenza. When the elder girl came under observation the neuritis had nearly passed off; the optic discs were atrophied, and all perception of light was abolished. The younger patient was seen three weeks after the sight began to fail; the neuritis was then well marked. The right eye saw $\frac{8}{200}$, the left eye $\frac{4}{200}$. The neuritis had, to a great extent, cleared up, but the discs were atrophic-looking, and there had been very little improvement in sight. Mr. Snell referred to the cases published by Macnamara and Lee.

Mr. Marcus Gunn mentioned a case under his care at Moorfields, in a man aged 45. There were very slight visible changes in the discs, but sight in one eye was abolished, and in the other was defective. He thought the case was one of retro-ocular neuritis, and an attack of influenza a short time previously was the only cause to which the condition could be ascribed. Recovery began in a couple of weeks, and the blind eye regained useful vision.

Mr. Cross (Clifton) referred to two cases he had seen, both in young women, in whom there was no evidence of intracranial disease, and nothing which seemed to bear a causal relation to the neuritis except influenza. In these cases vision failed rapidly within a few days of the attack.

Mr. McHardy spoke of two cases he had seen, and which

he had considered as most probably due to influenza, no other cause being ascertainable. Both his patients were females, and in both there was temporary albuminuria. He had treated them by absolute rest in bed, and the administration of iron; recovery had ensued.

Living and Card Specimens.— Dr. D. J. Wood: Drawing of a Case of Detachment of Retina, with unusual Dilatation of Retinal Veins.—Mr. J. Griffith: Instrument for Removal of Meibomian Cysts of the Lower Lid.—Dr. Redmond: Tuberculous Disease of Iris.—Mr. Juler: Congenital Cleft of Upper Lid; Congenital Dermoid Cyst.—Dr. James Anderson: Paralysis of Third Nerve in a case of Migraine.—Mr. Marcus Gunn: Ophthalmoscopic Drawing, showing changes in the Retinal Vessels in Chronic Albuminuria.

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direction. It is narrow antero-posteriorly, separated behind by a thin layer of bone from the anterior fossa of the skull, and is bounded in front by the superciliary ridge and the adjoining surface of bone. Down-

* Read before the meeting of the British Medical Association at Nottingham, July, 1892.

S

wards it reaches to within three or four millimetres of the articulation between the summit of the nasal process of the superior maxillary bone and the internal angular process of the frontal. Where it comes into close relation with the orbit, at the internal superior angle (of the orbit) the sinus bends back at a right angle, and spreads out along the orbital arch over a varying surface usually reaching outward about on a level with the supra-orbital notch. Above and behind the upper part of the lacrymal groove, the sinus narrows into a canal which passes directly downwards, almost parallel with the groove, into the infundibulum, and thus terminates with the anterior ethmoidal cells in the middle meatus of the nose, just at the front of the middle turbinated bone. The lower part of the sinus is on a little higher level than the upper part of the lacrymal sac; and the upper inner wall of the orbital cavity is separated from the anterior fossa of the skull by the sinus. The size of the sinuses largely varies; sometimes they widely separate the orbital roof from the frontal surface of the skull, and may pass outwards almost to reach the zygoma. When distended by empyema or hydatids they are more easily trephined without damage to adjoining cavities; but I consider the place of selection for opening the sinus from the orbit to be just behind the orbital margin, about ten millimetres above the tendo oculi, or five millimetres above the articulation of the internal angular process with the nasal spine, because this strikes the most dependent point, and gets near to the infundibulum, which is the proper channel of exit. The shaft of the trephine should be held in and up in a line with the malar eminence, and should pass backward just so much as is necessitated by the position of the eyeball.

Case 2.—On April 14, 1891, S. W., a girl, aged 16, came complaining of a painful swelling under the right upper lid. There was considerable fulness of the

upper orbital region, particularly towards the inner side of the orbit high up. Here a large intra-orbital tumour was felt inside and above and somewhat behind the eye, which latter appeared to have a tendency downwards, but it was usually parallel in fixation with the left. Pressure on the tumour caused diplopia and rolled the cornea somewhat inward. She said that the swelling had been noticed for about four months above and inside the right eyeball, that it varied in size from time to time, sometimes looking almost as large as the eye itself, which it pushed down, causing occasional double vision. For two months she had suffered pain about the right side of the forehead, varying in degree, and apparently in an inverse ratio with the size of the swelling. For some years she had been liable to a peculiar feeling on the right side of the head, as if the nostril were blocked; there had been no discharge from the nose; the patient was not liable to colds in the head, she could blow freely down the right nostril, but the left always felt much clearer. An attack of scarlet fever eight or nine years ago seemed to have been the starting-point of the illness, for she then had an abscess close to the caruncle, of the existence of which a distinct scar over the lacrymal sac still gives evidence, and after this she had strumous abscesses in the neck. She said that five years ago she had consulted me for frontal headache and asthenopia. In March, 1890, she had an attack of influenza. Examination showed that vision was equal in the two eyes, $\frac{5}{9}$ J4 + 1 = $\frac{5}{6}$ J1. The tumour seemed surrounded by a raised bony circumference, which was very tender; the centre was soft and fluctuating. It reached far back into the orbit, and was high up on the inner wall. Its condition varied somewhat in size, fluctuation, and tenderness. On May 14 a horizontal incision was made through the skin of the upper lid and through the thin fibrous and bony surface of the tumour, which allowed the escape of a quantity of

semi-solid, yellowish pus and gummy viscous matter, evidently from the frontal sinus. The cavity was well syringed out with mercuric-bichloride solution, none of which seemed to pass out by the throat or nose. A drain was inserted into the sinus from the wound. The operation entirely removed the pain, the head felt clearer, and the nose was partly relieved. Drain removed on May 22. The discharge is more abundant when the patient sits up than when lying down. June 5, after straining, a sudden escape of muco-purulent fluid came through the lid wound. June 9, the patient went home: the wound scarcely discharging, and the eye somewhat prominent.

August 4, she was re-admitted to the hospital for pain in the head and recurrence of the swelling. The vision of the right eye had been reduced to J. 20, no neuritis, but distinct congestion of the retinal veins. The sinus was swollen and discharging slightly. The pain over it was very severe. She was retained for twenty-four days, but no operation was done, as with rest a marked amelioration of the headache, inflammation, and discharge took place.

On September 28 the symptoms again recurred, and some congestion and discomfort of the parts on the inner side of the left eye were observed.

On October 4 I again operated, cutting down the wall of the sinus, enlarging the opening in the bone. The left forefinger was thrust into the sinus, which was found much distended in all directions. The small finger of the right hand was pushed up under the middle turbinated bone in the right nostril, and a free communication made between the two, through which a drain was drawn from the palpebral incision to the nostril. Injections into the upper end of the tube, however, did not traverse it. Some pressure prevented drainage downwards; the discharge always came from the top end of the tube, and only on one occasion did the injections come out at the nostril. In other

respects the operation seemed to be successful. The patient went home on November 9, and on November 12 the tube was removed. On November 16 it was noted that there had been no discharge at the nose, but at the palpebral opening only. The wound was almost healed; the patient free of pain. With the healing of the palpebral wound the swelling and the pains recurred. The patient was feeling very ill, and frontal headache was very severe. Further interference seemed necessary, and I determined to search carefully and remove any caries, and at the same time to aim at drainage downward through the nostril. On January 20 I again opened the frontal sinus from the orbit. It consisted of a large bony cavity passing upwards behind the supra-orbital margin towards the cranium, into which the finger could be easily introduced between the orbital and cranial surfaces. Far back, at a depth of 5 centimetres, was another cavity reaching into the posterior ethmoidal and sphenoidal cells. The distended inner wall of the orbit was pushed towards the eyeball. The whole cavity seemed to be lined by gelatinous tissue, but no sequestrum nor distinct caries could be found. The inner wall of the orbit was freely removed, with considerable portions of the ethmoid, leaving a thickened nasal mucous membrane which separated a probe passed upwards from the nose towards the cavity. A drain was passed downwards through the front part of the ethmoid. The cavity had been lightly scraped with a blunt spoon; this was probably unwise, particularly if it had been done towards the cranial surface. Otherwise I know of nothing to unfavourably criticise in the operation, which needed to be thorough if any good result was to be expected.

The patient passed a very restless night, and vomited a good deal of blood. On the 23rd she seemed much better, though slightly feverish. Four days after the operation she felt ill; the temperature was high; she slept badly, and next day was frequently crying out

with severe pain in the head and neck and in the right cheek. Six days after the operation she became drowsy, was partially hemiplegic on the left side, the hemiplegia becoming complete, with occasional twitchings of the angle of the mouth and shoulder. Fæces were passed unconsciously, but she remained sensible, knew her friends, and swallowed easily. She died on the same day.

Post-mortem Examination of the Head.—No fluid was found in the subdural space. The internal surface of the dura mater over the whole upper convexity of the right hemisphere was covered with a layer of yellow lymph, which could be easily rubbed off. The pia-arachnoid over the whole of the convex surface of the right cerebral hemisphere was infiltrated with yellow lymph. On the left side the dura mater and pia-arachnoid were merely injected. On removal of the brain the pia-arachnoid over the orbital surface of the right frontal lobe was injected, and showed very slight deposits of lymph, which could also be traced on the under surface of the optic chiasma, extending back as far as the pons. The layer of lymph on the under surface of the brain was scarcely discernible, whilst that on the convex surface was very marked; the line of demarcation was very marked, a horizontal line around the side of the brain separating the definite layer of lymph above from the indefinite below. Section of the brain gave no evidence of inflammation in the cortex or elsewhere. In the base of the skull the dura mater of the right side in the anterior fossa, the middle fossa, and the upper surface of the tentorium showed a thin deposit of lymph. The bone beneath the dura mater in the anterior fossa was normal, and there was no fracture nor inflammation.

The roof of the right orbit was then removed. A thick crest of bone passed backward on the roof of the orbit for about an inch from near the supra-orbital notch, and indicated where the inner wall of the orbit,

pushed down and out, had separated the eye from the frontal sinus. This wall was now completely absent, so that the orbit and the sinus formed one large cavity; a considerable portion of the lateral mass of the ethmoid was removed, but the cranial portion of the frontal and ethmoid were uninjured. The sinus was distended upwards in the frontal bone for an inch above the orbital margin, and it extended outwards between the cranial and orbital surfaces of the frontal bone across the whole width of the roof of the orbit, or for three-quarters of an inch beyond the ridge just mentioned. The sinus was lined by mucous membrane infiltrated with pus. Extending backwards the cavity passed into the ethmoidal sinuses, and here much blood-clot existed. A passage one-third of an inch in diameter passed down into the middle meatus through which the drainage-tube had passed. The outer and lower parts of the right orbit were normal. The left frontal sinus, lined by healthy mucous membrane, extended upwards only half an inch, close to the middle line, and outwards to midway across the orbital roof.

Case 3.—A. P., aged 13½, came on August 10, 1891, complaining of great pain in the orbit behind the right eye, with proptosis, fulness inside and beneath the upper lid, and fever. There was no evidence when or why the swelling commenced. It was evidently an abscess on the inner wall of the orbit, probably frontal empyema. He was detained in Clifton; leeches and hot fomentations were applied; the same evening the abscess burst into the nose with rapid relief to all the symptoms. Two days afterwards the boy went home apparently well, some œdema of the upper lid remaining.

August 20, I received a telegram that the swelling and pain had recurred. August 21, the boy came up, but the swelling and pain of yesterday had been suddenly relieved by the discharge of blood and matter into the nose. Vision $\frac{5}{7}$ (L. $\frac{5}{5}$); a definite fulness

existed on the inner wall of the right orbit above the tendo-palpebrarum. One or two recurrences of the abscess relieved by discharge into the nose occurred at Winchester school during the following term, and the patient was also said to have suffered slight attacks of vertigo. Soon afterwards a discharge, varying in quantity, constantly occurred from the right nostril; the caruncle and neighbouring conjunctiva were always congested, but there was no epiphora; the right eyeball was farther from the nose than its fellow, and a fulness remained just above the caruncle, on a level with the base of the nose. I advised that the boy should be sent to school at the seaside, in a hope that a cure by natural processes might result, and the nostril was daily syringed with antiseptics. After some time Dr. Alford, of Weston, under whose care the boy had been placed, advised me that there was no real improvement, and after further consultation with Mr. Lawson and Dr. Woakes, it was decided to trephine the frontal sinus. On May 25, 1892, I made an incision along the margin of the orbit and over the swelling, from which the soft tissues were detached; a trephine 7 millimetres in diameter was applied up and in and a little backward, just behind the orbital margin and above the root of the nose. This at once penetrated the sinus, and gave exit to some creamy yellowish pus. After enlarging the opening a tube was easily drawn down the middle meatus of the nose, along what was supposed to be the dilated infundibulum, one end emerging from the nostril and the other from the wound. Fluid injected into either extremity readily traversed the whole tube. On the second day the drain was blocked by débris and clots. For a few days the boy was faint. On the fifth day the tube was easily washed clear; there was a moderate amount of muco-purulent discharge, which always came rather from the nostril than from the upper end of the tube. On the 14th day the tube was divided, so that the lower end should drain the sinus towards the

nostril. The upper end was replaced by a piece of smaller calibre, so as to allow of gradual healing of the upper wound.

Fluid injected into the upper tube still passed freely out at the nostril, and three weeks after the operation both tubes were removed. Two days later severe epistaxis of the right nostril occurred, and recurred two or three times. A month from the operation the boy returned to Weston; the skin wound was almost healed, some fulness still remained over the bone. There was no tenderness, the nostril was said to be much more free than it had been for several months, and the discharge into it was lessening. On July 23 Dr. Alford writes: "I saw P. this morning. He is doing very satisfactorily. The scar is much less noticeable, and has little puckering. There is still some discharge from the nose, chiefly thin watery secretion, with mucus. The nostril is quite free. He has no pain at all. The sight is perfect; his head rarely aches, and he has been able to get through his term examinations very well."

No definite statement can be made as to the causation of empyema of the frontal sinus: it probably depends on blocking of the frontal canal leading to the infundibulum; this might easily occur from periostitis or swelling of the mucous membrane. In many of the cases there has been a history of coryza over a longer or shorter period, sometimes connected with nose-bleedings or the discharge of fœtid pus. The nasal discharge may last for many years without any other symptom; neuralgia in the region of the sinus, and headache, which varies in intensity and range, sooner or later supervene, or may occur before any definite nasal catarrh, and this severe headache is an extremely important point in diagnosis. Polypi very rarely, if ever, cause frontal empyæma, although they are said frequently to grow from the infundibulum.

The imprisoned fluid distends the bone often just above and behind the tendo-palpebrarum, causing

widening of the eye and conjunctival congestion close to the caruncle, epiphora may occur, and Leber published a case in which this symptom was the only inconvenience. As in my first case, the protrusion may be higher up, simulating exostosis, or, as in case 2, it may tend to get behind the eyeball. Sometimes the tendency seems rather to penetrate the anterior wall in the forehead, and, if so, this spot should be selected for the trephining. In my second case the mischief seems to have started with an attack of scarlet fever, and the allied fevers have been held responsible by some writers.

In several of the published cases direct injury of the walls of the sinus from blows or falls seems to have been the cause. Lawson trephined a man of fifty-eight, whose nose was broken at four years old. Necrosis would seem to be uncommon. Spencer Watson relates a case where the orbital wall of the sinus became completely separated, shaped like a piece of eggshell. Occasionally there has been perforation of the cranium, but death as a result of the disease appears to have been very rarely reported. One case is quoted by Nicati in his excellent monograph (*Archives d'Ophthalmologie*, 1891). A man of twenty-two came under Bousquet on September 16, 1877, for an abscess in connection with the right superciliary margin. Incision gave exit to fœtid pus drainage; the bone was rough and denuded, abundant suppuration followed, the patient became dull, and on September 30 had an epileptiform seizure. He died two days afterwards, after intense convulsions. The right frontal sinus was full of pus, and communicated by an aperture with the orbit, and by another with the anterior fossa of the skull, separated from the brain by the dura mater. A distinct and separate abscess as large as an egg occupied the right frontal lobe.

Though the disease is essentially chronic, its symptoms may be very acute and accompanied by delirium and fever (Ribire) before any tumour is evident. It is

usually seen after adult age. I have found no published cases under twenty years. It seems equally common in each decade up to sixty. In a great many of the patients, however, symptoms have been present in early life. A man aged seventy-one, operated on by Betbeze, had been suffering from frontal neuralgia since eighteen. My three patients were unusually young—seventeen, sixteen, and under fourteen respectively. The prognosis is probably most favourable where discharge is free into the nose; and good nasal drainage where possible along the infundibulum is the disideratum in treatment. When the tendency of the sinus is to extend upwards along its cranial surface, and backwards into the ethmoidal region, as in my second case, it becomes a much more serious matter; and although my patient died so soon after the operation, I cannot blame myself for the fatal result.

ANTONELLI, DR. ALB. **Optic Neuritis, Papillary and Retrobulbar, following Influenza.** *Recueil d'Ophthal. May and June*, 1892.

The author has been at great pains to collect all the published cases of ocular affections attributed to influenza, and to give the list of them at the beginning of this paper. It includes various forms of conjunctivitis, keratitis, affections of lids, and lacrymal apparatus, nervous lesions, paralysis of accommodation, of the sympathetic, ophthalmoplegia ; neuralgia and anæsthesia of the cornea ; glaucoma, iritis, choroiditis, panophthalmitis, neuritis, papillitis and optic atrophy. The list is a formidable one, there are very few affections of the eye which have not been attributed to influenza ; but, however much we may be inclined to question the dependence of all these varied affections on influenza, there is not much ground for doing

so, as a very large proportion of the cases have been reported by competent and careful observers.

Dr. Antonelli adds notes of two cases of optic neuritis, following influenza, which occurred at Professor Javal's clinic. In the first case, twenty days after the beginning of a moderately severe attack of influenza vision began to fail, and continued to get worse until shortly before the patient was seen, a month later. When seen, the eyes appeared normal, the pupils rather dilated, but responsive to light, V was reduced to $\frac{1}{10}$ and $\frac{5}{80}$ in the R. and L. respectively, there was slight constriction of the field, almost complete loss of appreciation of red and green, not more marked at the centre than elsewhere. The O. D. was atrophic, like that of the early stage of tabes. The case was judged to be one of retrobulbar neuritis affecting the whole thickness of the trunk of the nerve.

The second case was one of bilateral neuro-retinitis in myopic eyes already affected with staphyloma posticum, and disseminated choroiditis. The vision began to fail fifteen days after the onset of influenza, and in a fortnight the patient was almost blind; there had been slight recovery when he was seen, so that he could count fingers at one metre distance. At the time of the examination, nearly a year later, the inflammatory process had ceased, leaving atrophy of the O. D.'s with hæmorrhages and exudations into the retinæ.

The conclusions at which the author arrives from the examination of the published cases, twenty-seven in number, are that the poison of influenza can attack the optic nerve on one or both sides, and in any part of its course; that is, that there may be either papillitis or retrobulbar neuritis. The papillitis occurs from 3–14 days after the onset of the illness, and there does not appear to be any relation between this interval and the severity of the attack. For the first few days there is great periorbital discomfort, pain on movement, and sensitiveness to pressure; the loss of sight is rapid, and may lead to complete blindness within 24 or 48 hours. After this acute period, during which examination shows the existence of papillitis, vision begins to improve.

The retrobulbar form is more common; it begins during

convalescence from general symptoms from 5–15 days after the onset of the disease. It is accompanied by dull pain, worse on movement ; the loss of sight is less rapid than in the papillitis, and attains its maximum much later, in some cases as late as a month.

As to recovery, prognosis must be guarded ; there will be in almost every case a slow but marked improvement depending on the amount of atrophy of the nerve ; there may be even complete restoration of vision.

W. T. HOLMES SPICER.

FUCHS (Vienna). On Dotted Corneal Deposits of Lens-matter. *Sonder-Abdruck aus Beiträge zur Augenheilk. III.* 1891.

The small dotted deposits on the back of cornea to which the author refers are very similar in appearance to those commonly associated with irido-cyclitis. Fuchs has observed them for some years, chiefly in cases of needling for soft cataracts, but also in other cases of injury to the capsule with resulting swelling of the lens. They are essentially different from those of keratitis punctata, seeing that they are in no way the result of inflammation, but consist of small portions of lens-substance which have become separated from the lens and attached to the posterior wall of the cornea. Six cases only are referred to in this paper, although many more have been observed. Of these six, three were men and three women of ages varying from 17 to 35 years. In one case the anterior capsule was ruptured as the result of an accident, while in the remaining five discission had been intentionally performed for the cure of soft cataract. As a rule some weeks intervened between the operation and the appearance of the dots, but on one occasion they were seen a fortnight afterwards. The under half of the cornea was generally more affected than the upper, and the larger dots were almost always situated at a lower level than the smaller ones. The deposits were all small, although some were much smaller than others, and in no case was there even an

approach in size to that of the larger spots of irido-cyclitis. Their colour was usually grey or yellowish brown, and in one instance they were so dark brown as to seem almost black; in this last case it is noteworthy that a few black points remained permanently after the rest had disappeared. It was generally noticed that, even when the spots were for the most part coloured, a few white or grey ones could be seen lying amongst them; these were frequently not so round as the coloured dots, but were irregularly angular—in fact, they closely resembled the small opaque lens particles which may sometimes be seen clinging to a swollen lens, or lying at the bottom of the anterior chamber. That these dotted deposits are really small portions of lens Fuchs has no doubt, and his opinion was confirmed by the fact that in one of the six cases—an old traumatic cataract—where the lens contained numerous cholesterine crystals, several similar crystals were afterwards observed to be adherent to the back of the cornea, and surrounded by the more ordinary grey or brown deposits.

The eyes in which this affection was noticed were either altogether free from inflammation or showed a very slight hyperæmia of the iris, which, however, never lasted more than a few days. In a single instance the aqueous became a little muddy and a few posterior synechiæ were present. It was difficult to estimate the exact duration of the spots, as, while some were disappearing, others were in process of formation; but probably from a few days to two or three weeks would represent the time during which they persist.

The method of their formation may, in the author's opinion, be briefly explained as follows:—From the surface of the swollen lens, which has protruded through the ruptured capsule into the anterior chamber, numerous small fragments break off; the larger of these probably sink at once to the bottom of the chamber, while the smaller ones remain suspended in the aqueous: these may in their turn sink to the bottom, or they may be absorbed; or, again, they may be washed against the posterior wall of the cornea, to which they become adherent. Their adhesion to the cornea is probably due to the albumin of the aqueous and to the fact that a delicate sheath of fibrin is, in these cases, spread

over the posterior corneal surface—at least, Fuchs assumes this last to be true, founding his hypothesis on the fact that Schirmer, after experimental opening of the capsule, detected a thin fibrinous sheath over the lens and iris, and there seems no reason why, under similar conditions, this layer should not be formed on the cornea also.

The lens-particles, when first broken off, are, as already explained, white or light grey in colour, and irregularly angular in shape. But the longer they remain suspended in the aqueous the more rounded they become, owing, as our author thinks, to the edges being polished off by impact against the walls of the anterior chamber. Similarly, the longer they swim about in the aqueous the deeper pigmentation do they show. Different theories may be advanced to explain how these small portions of lens become pigmented: thus, some may derive their pigment directly from the posterior surface of the iris; but this could happen only to such particles as originally lay behind and in contact with the iris, and which later have escaped through the pupil into the anterior chamber; or it might be that white blood-corpuscles, which came from the iris and are stained with its pigment, have ultimately become adherent to the floating morsels of lens; a third suggestion, and perhaps a more probable one, is that the lens-matter obtains its colour from the iris pigment-cells, which, after rupture of the capsule, are known to be present in the aqueous. In the experiments to which we have already referred Schirmer invariably found these cells in the aqueous humour immediately after he had incised the lens-capsule, and they persist throughout the entire process of healing. It is obvious that the longer the small portions of lens remain suspended in the same fluid as the pigment-cells the more likelihood is there that they shall be stained by them. In this manner, therefore, Fuchs concludes that the age of the particles may be roughly gauged by their shape and colour, and that the roundest and most deeply stained are also the oldest.

The relatively short time which these little dots remain on the cornea, as compared with the dots of irido-cyclitis, is due to the fact that, being lens-substance, they are comparatively quickly absorbed. N. M. ML.

KNAPP (New York). On Glaucoma after Discission of Secondary Cataract and its Successful Treatment by Iridectomy. *Archiv. of Ophth.* XXI. 2.

Ten cases of glaucoma occurring after discission of secondary cataract are here reported; the first four have been previously published, but they are included in the present series as making it more complete. In eight of these an iridectomy was performed with immediate and permanent relief of the glaucomatous symptoms, one was cured by eserine without the necessity of an operation, while in the remaining case the glaucoma was allowed to go on for so long a time that, when the patient finally consulted Knapp, all vision was lost, and, the acuteness of the symptoms having passed off, nothing was done. Without transcribing the details of the various cases, we may briefly refer to one or two as more or less typical of all, and more especially to that of Lilly L., æt. 32, in whom glaucoma following needling occurred in *both* eyes after regular extractions performed at an interval of eight months. This patient was a healthy woman with cataract of three years' standing, which was mature and uncomplicated. On December 6, 1890, the right lens was removed by a simple extraction, The operation went smoothly, and the wound healed without a hitch. She was discharged in nine days with vision $=\frac{20}{50}$. She returned on January 2, 1891, vision then being $\frac{20}{70}$, and discission was performed as usual. For five days all went well, and then acute glaucoma set in, T + 2, iris bulging all round the periphery, sight very dim, etc. Eserine gave temporary relief, but the pain returned with an aggravation of symptoms, so that iridectomy became necessary. An incision was made 2 mm. behind the corneal section, through which clear viscid vitreous escaped; the iris was drawn through the wound, and cut with the protruding vitreous close to the cornea. The pain ceased at once, the wound healed in two days, and the patient left the hospital five days later. V. tested in April and again

in September, 1891 $= \frac{20}{20}$. There has been no relapse. The left eye, the lens of which was extracted some eight months after the right, ran a course almost exactly the same as that just described. The final result was equally satisfactory.

The last two cases of the series are noteworthy, inasmuch as the glaucoma occurred a considerable time after the discission, viz., a year and fourteen months respectively. In one of these the actual glaucoma was preceded by occasional very slight inflammatory attacks, which occurred in connection with a minute vesicle situated about the centre of the corneal scar. So soon as this little vesicle broke all inflammation subsided; but the attacks became more frequent and more typically glaucomatous, so that it was deemed wise to perform an iridectomy. There has been no recurrence since. In the other and last case there is nothing peculiar to note beyond the slow onset of the disease.

As to the pathogenesis of glaucoma under these circumstances Knapp has not ventured to make any suggestion. Beyond a few non-inflammatory posterior synechiæ, and the corneal fistula above referred to, there were no complications in any of the cases; in no instance was the iris caught in the corneal wound.

In view of the occasional occurrence of glaucoma, the author thinks it wiser to divide the capsule by a T-shaped incision rather than by one in the form of a +, although the latter method probably gives a clearer pupil. He notes that in all the operations normal vitreous escaped, but without apparently doing any harm. With reference to the question of an alternative operation, *e.g.*, paracentesis, or sclerotomy, he clings to iridectomy, as involving no greater risk than the others, and probably ensuring a much better result. Finally, he sees no reason to abandon the simple extraction of cataract in favour of that combined with iridectomy, simply because glaucoma has occurred in about 1 per cent. of his total cases. He considers the simple extraction with peripheric opening and subsequent discission of the capsule the method which has given him fewer failures and more permanently good results than any other;

and in the very occasional event of the onset of glaucoma, an iridectomy, which, by the way, need not be a large one, may always be counted on as a certain means of cure.

N. M. ML.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

FRIDAY, JULY 8, 1892.

HENRY POWER, F.R.C.S., President, in the Chair.

Implantation Cyst in the Anterior Chamber after Cataract Extraction.—Messrs. Richardson Cross and Treacher Collins reported two cases. The first was that of a woman, aged sixty-four, who had had an uncomplicated extraction of cataract with iridectomy performed on her left eye, and who subsequently could see to read and sew. Seven months after the operation an attack of acute glaucoma came on, and the sight rapidly failed. The eye was excised a year later. Examination of the eyeball, after excision, showed that in the anterior chamber there was a large cyst, lined throughout by laminated epithelium. It was bounded in front by the posterior surface of the cornea, below by the anterior surface of the iris, which curved round it, and behind partly

by the lens capsule and partly by the hyaloid of the vitreous. The iris, where it ceased to be in contact with the cyst, was in apposition with the cornea. The angle of the anterior chamber was closed in its entire circumference, a portion of

the root of the iris having been left above in the situation of the coloboma. The optic disc was cupped.

The second case was that of a man, aged forty-one, who had a cataract extracted from his left eye, with iridectomy. At the conclusion of the operation the anterior chamber was washed out with a solution of the biniodide of mercury 1 in 25,000. Striated keratitis came on subsequently and persisted. Seven months later a thick opaque membrane filling the coloboma was needled; after this the eye remained painful and bloodshot, the cornea became more hazy, and new blood-vessels developed in it. The eyeball was ultimately excised two years after the extraction. At the pathological examination a cyst was found in the anterior chamber lined by laminated epithelium closely resembling that on the surface of the cornea, the most flattened cells being towards the interior of the cyst.

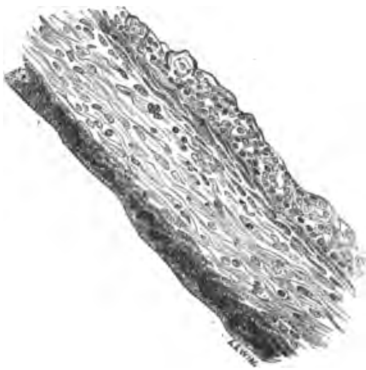

Fig. 2.—Laminated epithelium lining the cyst, on the anterior surface of the iris.

The cyst was somewhat triangular, one side being in contact with the cornea, another with the iris, and a third with the lens capsule and vitreous.

For the determination of the mode of formation of these cysts, the writers considered it was necessary to ascertain the origin of the laminated epithelium found lining them. Two possible sources suggested themselves: (1) that it was derived from proliferation of the endothelium lining Descemet's membrane, and the anterior surface of the iris;

(2) that some of the surface epithelium was carried in at the time of the operation, and had subsequently proliferated. The latter view seemed the more probable because the epithelium was found on the surface of the lens capsule and the hyaloid of the vitreous, and was not confined to the iris and Descemet's membrane, and because epithelial-lined cysts had been produced experimentally in rabbits' eyes by such implantations of surface epithelium. The first case was of additional interest from the fact that the eye became glaucomatous. The cyst, which filled the whole of the coloboma, must have prevented fluids passing through it into the anterior chamber. Consequently the iris became pressed forwards into contact with the cornea, and folded round the cyst, very much as it is round a lens when dislocated into the anterior chamber and blocking the pupil. In this way the whole of the filtration area of the cornea became closed by the periphery of the iris, and the exit of intraocular fluids arrested. The paper was illustrated by lantern slides.

The President thought it remarkable that cysts from implantation of surface epithelium were not more common after extraction of cataract.

Mr. Hulke said that cysts of the iris had in his experience followed accidental perforating wounds of the eyeball. Their occurrence after operative incisions was comparatively new to him, but he thought that the explanation given by the authors of the paper was probably correct for both classes of cases.

Accidental Vaccinia of the Eyelids.—Mr. Tatham Thompson (Cardiff) communicated notes of the case of a man, aged thirty-eight, whose left eyelids had become accidentally inoculated. The lids were œdematous and painful, and at the outer canthus the edges were involved in a purulent ulcer with indurated margins. There was great tenderness of the affected parts and painful enlargement of the glands at the angle of the jaw and down the sterno-mastoid. The man's child had been vaccinated a short time previously, and his wife had been accidentally inoculated therefrom. The man had suffered from slight marginal blepharitis, with excoriation at the outer canthus, and the inoculation had probably occurred at that point.

A Case of Symmetrical Dacryo-adenitis.—This case was reported by Mr. Simeon Snell (Sheffield). The patient was a married woman, aged thirty-six, who came under observation on March 22. Ten weeks previously the right eye became inflamed; this was soon followed by a swelling beneath the upper lid, which gradually increased and was accompanied by pain. A similar condition on the left side had begun a week before she came to the hospital. Both lacrymal glands were enlarged, hard, and tender to the touch, the right being much more affected than the left. The history threw no light upon the cause of the disease. In spite of the absence of evidence of syphilis, iodide of potassium (5 grains) was given three times a day, and was rapidly followed by subsidence of the swelling and other signs. During the time the lacrymal glands were decidedly enlarged, there was an almost complete absence of tears on the right side, and a noticeable diminution in their secretion on the left side.

Living and Card Specimens.—Mr. Lindsay Johnson: A modification of Priestley Smith's Perimeter, with adaptation of electric light. Mr. S. A. Stephenson: A Meridian Delineator. Mr. Juler: A Case of Optic Neuritis with retinal changes. Mr. Sheppard: A Strabismus Hook with cutting edge. Mr. Tatham Thompson: (1) Episcleral Gumma; (2) Rupture of Choroid in Macular Region; (3) Rodent Ulcer of Face, with great hypertrophy of eyelid; (4) Recurrent Sarcoma in Parotid Region. Mr. Brailey: Ectropion following Burn treated by transplantation of skin from the arm. Dr. D. J. Wood: Partial Detachment of Retina with unusual dilatation of retinal veins.

Election of Officers.—The annual meeting of the Society was held after the ordinary meeting and the following officers elected for the ensuing year:—President: Henry Power. Vice-Presidents: James Bankart, Exeter; John Hughlings Jackson, M.D., LL.D., F.R.S.; George Lawson; William M. Ord, M.D.; D. C. Lloyd Owen, Birmingham; Simeon Snell, Sheffield; John Tweedy. Treasurer: George Cowell. Secretaries: Charles E. Beevor, M.D.; Gustavus Hartridge. Librarian: W. Adams Frost. Other Members of Council: James Anderson, M.D.; F. Richardson Cross, Bristol; James McKenzie Davidson, M.B., Aberdeen; Robert

W. Doyne, Oxford; Henry Eales, Birmingham; J. R. Lunn; J. A. Ormerod, M.D.; Herbert William Page; D. D. Redmond, Dublin; W. C. Rockliffe, M.D., Hull; G. H. Savage, M.D.; A. Quarry Silcock.

AMERICAN MEDICAL ASSOCIATION.

SECTION OF OPHTHALMOLOGY.

FORTY-FIFTH ANNUAL MEETING, HELD IN DETROIT, JUNE, 1892.

Chairman, DR. J. L. THOMPSON, of Indianapolis.

Gradation of Lenses.—Dr. Dudley S. Reynolds, of Louisville, advocated the adoption of the system of numbering lenses he had proposed at the Ninth International Medical Congress, by which each lens would be designated by the angle of the pencil it formed from parallel rays passing through it in the direction of its principal axis. By numbering lenses thus, by degrees and fractions of a degree, the slightest variations in strength could be readily indicated.

Normal Corneal Astigmatism.—Dr. H. V. Wuerdemann, of Milwaukee, read a paper based on observations with the ophthalmometer, an instrument necessary to the ophthalmic surgeon. He does not find that this instrument gives the total astigmatism of the eye, and thinks the varying reports on the relation of the corneal to the total astigmatism may be accounted for by the personal equation of the operator and his method of examination. By following the usual instructions for keratometry with the ophthalmometer of Javal and Schiötz an error of 1 D. may be made. He advocates instead the comparison of the black interspaces in approximating the plaques, and reading from the graduated arc the exact refraction of the principal meridians.

On measurement along the principal and oblique meridians at 5° intervals from the visual centre to the limbus, all corneæ are found highly astigmatic in the

periphery, and in most the curvature diminishes more rapidly in the vertical than in the horizontal meridian. The area extending 5° on each side of the visual axis serves for most purposes of direct vision, and if this area be free from astigmatism the eye may called non-astigmatic. The optical portion of the cornea, however, embraces an area of about 17° around the pupillary centre. It is ellipsoidal in shape with the long axis approaching the vertical, being limited by the angular aperture of the pupil. This does not coincide with the polar zone, which extends from 10° to 20° around the corneal axis, and which is ellipsoidal, with its long axis in the direction of the general astigmatic axis.

The amount of astigmatism is influenced by the position of the visual line relative to the polar zone. Corneal astigmatism of 3 or 4 D. may be produced by the visual line passing eccentrically through the cornea.

From the records of 300 eyes, of which 63 were emmetropic, 52 simply hyperopic, 8 simply myopic, and the rest showing total astigmatism, 93 per cent. of the whole number were found to have corneal astigmatism appreciable by the ophthalmometer.

All of the emmetropic, hyperopic, and myopic eyes had corneal errors ranging from a little less than 0·25 D. to 1·50 D. In adults the corneal astigmatism was usually 0·50 D. greater than the total when the meridian of greatest refraction was vertical, and the same amount less when horizontal. In old people the average difference was 0·25 D. and in children 0·75 D. Most of the cases in which the corneal equalled the total error were found in the elderly. This statement is general, as the amount was modified by the kind of general ametropia, and the amount of lenticular decentration. The difference is the astigmatism neutralised by a corresponding lenticular astigmatism against the rule, which has its origin in the oblique position of the lenticular refracting surfaces to the visual line. The decrease in difference observed in old subjects may perhaps be explained by senile changes in the lens structure increasing its refraction.

Wuerdemann considers that a total astigmatism is not

fully corrected by cylindrical lenses on account of the irregular or meridional astigmatism which exists in all eyes within a few degrees of the visual axis. He regards as normal that amount of corneal astigmatism which is neutralised by the lenticular error.

In the use of the ophthalmometer for glass fitting he is generally prepared to subtract 0.50 to 0.75 D. from its readings when with the rule, and to add the same when against the rule.

Dr. Henry D. Noyes, of New York, said it was well known that the irregularity of the form of the cornea does not lend itself to any mathematical formula. It is only the central portion that is available for accurate vision, and this implies that the vision that we can hope to get by an iridectomy must necessarily be imperfect if the central portion of the cornea is excluded. If the central portion of the cornea remains in use it does not follow that the irregularity of curve of the peripheral portion will have any great depreciating influence on vision. This is demonstrated by the fact that, after the extraction of cataract with iridectomy, vision as good as that obtained from the operation without iridectomy results. The value of the ophthalmometer is higher than is generally supposed. His experience is that it gives you the glass to be employed within about 0·50 D.; and many times it gives the exact error and the glass required so far as the cylinder is concerned. Another fact that is brought out by the examination with the ophthalmometer is that the principal meridians of the cornea are not at right angles to each other. The consequence is that you have to adjust the axes of the cylinders as the patient will accept them, and not according to what the ophthalmometer shows to be the true condition. In other words, the determination of what the patient must wear is a practical question of experiment. The value of the ophthalmometer is to show the lines within which the experimentation must proceed. The use of the ophthalmometer has greatly eliminated the necessity for a mydriatic, the employment of which should be limited to cases where the amount of pain and the severity of the subjective phenomena make one feel that an anodyne must be applied;

and atropia is to be used rather as an anodyne than for the purpose of enabling one to determine the refractive error. Dr. Noyes added that in his own work he relied first on the ophthalmometer, second upon examination with the ophthalmoscope, in which the glass determined by the ophthalmometer is placed behind the mirror, and from this he went to the test-box to ascertain what could be done in the way of bringing the acuity of vision up to the normal.

Dr. S. D. Risley, of Philadelphia, wished to emphasise, as according with his own experience, the point that after the use of the ophthalmometer the glass to be prescribed is the result of subjective testing rather than the scientific result obtained with the ophthalmometer. The glass to be prescribed is the one selected by the patient as giving the best acuity of vision. As to the use of mydriatics, he found that most patients seeking relief from asthenopia presented the subjective symptoms mentioned by Dr. Noyes as calling for a mydriatic, but he did not agree that mydriatics were necessary only in these cases.

Dr. Wuerdemann said we cannot have too many means of objective examination. The ophthalmometer in searching for astigmatism is our most exact instrument, except in favourable cases under a mydriatic with retinoscopy. He reminded the section that his paper had dealt with the corneal, not with the total, astigmatism—often two quite different things. He was indisposed, in the higher degrees of astigmatism, to give the fully correcting glasses as shown by the ophthalmometer.

Dr. A. A. Hubbel, of Buffalo, found the higher the degree of astigmatism as shown by the ophthalmometer, the more we should under-correct it, and this agreed with what Javal had recently told him of his own practice, and with a recent article pointing out the inherent inaccuracy in the instrument.

Method of Examining the Eyes of School Children.—Dr. B. Alexander Randall, of Philadelphia, under this head touched upon the hygienic importance of such studies, and the shortcomings of many of those heretofore made, and gave a plan under which practical and scientifically valuable data could be obtained at the minimum cost of time. Distant vision

and astigmatism are tested for each eye by artificial light, the muscle balance by Maddox prism or rod test for a far point of light, and, for a near, by dot and line or pin-point. The punctum proximum is obtained for Jaeger No. 1, and the refraction by the direct ophthalmoscopic examination, retinoscopy, and, at need, with the test lenses; and the colour sense is tested by Holmgren's wools. These data, together with notes on the general health, any eye trouble, glasses, etc., can be entered on a blank headed with the name, age, sex, school, and class of the pupil, and the date of the examination. Recording these results himself, he was able, in an examination of 356 boys in the Penn Charter School of Philadelphia, to study about one dozen per hour; and, with a clinical clerk, an expert observer could easily make twenty such examinations in an hour, learning practically all ordinarily sought in the first consultation by the expert specialist.

Dr. F. Dowling, of Cincinnati, had found great difficulty in getting consent to such examinations, and in getting the lessons learned from them applied. He had found one-third more myopia in the German than in the English speaking schools, and had urged the adoption of the text-books printed in Latin letters instead of those printed in German text.

Dr. Randall said it was by such examinations that we were to obtain data from which to deal with the whole question of the correction of refraction errors, and attain a better comprehension of other more strictly hygienic questions of school influences upon the eyes of pupils. But the examinations must be carried out primarily with the understanding that they are for directly helping and guarding the children under examination, the removing if possible the faulty conditions under which they work, and picking out those who are unable to stand the pressure that their fellows can safely bear. The school authorities must be furnished with the results.

Latent and Manifest Hyperopia.—Dr. Edward Jackson, of Philadelphia, presented the results of a statistical study of 214 eyes, hyperopic without astigmatism, encountered in private practice, in which the manifest hyperopia had been carefully ascertained, and subsequently the total hyperopia

accurately measured under a mydriatic. To ascertain the manifest hyperopia, an approximate determination of it was first made with the ophthalmoscope; then, after the eyes had rested, lenses were placed simultaneously before both eyes that would certainly over-correct the hyperopia present. The strength of these lenses was then gradually reduced (placing the new lenses before the eyes before those previously tried had been removed, so as to allow no demand for accommodation), until such a change ceased to produce further improvement in vision. Then a card was held, first excluding one eye, then the other, to find if both saw equally well, and, if one eye showed a distinct inferiority, the lens before it was still further reduced until such reduction failed to produce further improvement in its vision.

Tested in this way the manifest hyperopia is found to be much higher than by testing each eye alone, or by beginning with weak convex lenses and increasing their strength until a notable blurring of vision occurs; but it was claimed that this higher amount must be regarded as the really manifest hyperopia, even though the lenses correcting it would only allow clear vision for a brief period. Estimated in this way, the relative frequency of latent hyperopia and the proportion and amount of it latent were shown in the accompanying table.

Age of patients.	Per cent. of eyes with some latent H.	Average per cent. of total H. latent.	Average dioptres of latent H.
8 to 15	21	30	0·7
15 to 20	21	26	0.45
20 to 25	23	34	0·57
25 to 30	36	33	0·62
30 to 35	37½	26	0·41
35 to 40	32	20	0·31
40 to 45	37½	15	0·39
45 to 50	47	33	0·38

The maximum proportion of eyes in which a portion of the hyperopia was latent was at the age of 47 or 48, and was fully fifty per cent.

The writer concluded that latency of hyperopia is

exceptional, inconstant, and abnormal; that latent hyperopia is not frequent or proportionately greater in youth than in early middle life; that a mydriatic is as frequently needed to render manifest the total hyperopia at 45 as at 15; and that the amount of hyperopia found manifest depends largely on the method of testing for it. In correcting hyperopia without a mydriatic, the assumption should be that the total hyperopia is manifest; and in prescribing a lens correcting less than the total hyperopia, to allow for the latency of a part of it is to allow for a temporary inconstant condition, and we should warn the patient of the probable early need for a change of glasses, and that the best result is not to be expected until after such change has been made.

Dr. Chas. H. Thomas, of Philadelphia, has found but few cases of latent hyperopia since learning to allow for the range distance at which the refraction was determined with the test lenses. He was struck with the parallel between the frequency of latent hyperopia and that of pseudo-myopia from spasm.

Dr. F. C. Hotz, of Chicago, was surprised at the small percentage of latent hyperopia Dr. Jackson had found up to the age of 30 or 35, and he was surprised that the amount was not greater than 0·75 D. In cases of convergent strabismus he was sure there was always a higher degree of latent hyperopia. In these points his experience did not agree with the observations presented in the paper.

Dr. B. A. Randall said in standing there is a certain tension of all the muscles concerned in maintaining the upright position, but we do not call that spasm, so in viewing distant objects in hyperopia there must always be a certain amount of accommodative effort, which need not be spasm, and which can be instantly relaxed as soon as the need for it passes away. To call every accommodative action of this sort spasm is a mistake. Such action is within the control of the individual.

Dr. Jackson feared he had not made prominent enough the influence of the method of testing the manifest hyperopia on the results obtained. For instance, in a case recently seen having 3·50 D. of hyperopia, 3·25 D. could be rendered

manifest by the method of testing employed in the investigation on which this paper was based. Yet with either eye tested separately full vision could not be obtained with anything stronger than a 2 D. convex lens. He could appreciate the surprise of Dr. Hotz; no one could have been more surprised than himself at these results. When he commenced the investigation he had fully believed the facts were in harmony with Donder's remark, and that up to the age of 20 years one-half or two-thirds of the total hyperopia would be found latent in all, or nearly all, cases, instead of its being in a large majority of cases entirely manifest.

Very Weak Prisms for the Relief of Hyperphoria.—Dr. A. E. Prince reported a series of twelve cases of slight tendency to vertical deviation of visual axes, in which relief from asthenopia, photophobia, conjunctival hyperæmia, headache, etc., had been obtained by the wearing of prisms with bases up or down, of only one-quarter or one-half degree aggregate strength. In almost all these cases the eyes were emmetropic, or there had been failure to give relief by correcting the ametropia without the prisms, and it seemed clear that the benefit was due to the prism.

In testing for such low degrees of hyperphoria it was recommended to use the Maddox rod, care being taken to avoid error from conicity of the rod by reversal, and by using it before each eye in turn. As a test-object the smallest point of light practicable should be used, and with a dark background. As a final step in the diagnosis, frames fitted with prisms should be supplied for temporary use to see if the wearing of them does actually give relief. The application of the Maddox rod-test with the prism held before the eye was suggested to the surgeon as a ready and accurate method of accurately measuring such weak prisms.

Dr. H. Gradle, of Chicago, said the significance of any results diminish as they approach the errors incident to the method employed. Here the least possible deviation of the frames from the proper position would cause for most spectacles a prismatic effect greater than that mentioned. Most of us can recall instances where patients were satisfied

with glasses that were incorrect or almost the reverse of what was needed.

Dr. Prince had in many cases secured the desired effect by simply decentering the lenses, sometimes after the spherical glasses had failed to give relief without such adjustment. He had seen cases in which as much as three degrees of hyperphoria had been tolerated without serious inconvenience. It is astonishing how well some people will tolerate astigmatism and hyperphoria. It is only to a minority of cases this paper refers; and a close study of these will reveal a certain proportion in which the one-fourth degree prism will afford relief.

Facial Expressions as Influenced by the Ocular Muscles.—Dr. George T. Stevens, of New York, had observed remarkable changes in facial expression to follow modification of the ocular muscles, and had been led to study these changes with greater care, bringing to his aid photography, and now offered results based on photographs and muscle records of two thousand persons. These demonstrated that certain well-defined types of facial expression are not only associated with, but are dependent on, certain relative tensions of the ocular muscles. Thus, in orthophoria the expression is one of comparative repose, the eyebrows form moderate regular curves, their lower borders corresponding to the orbital border, with no sharp curve at either extremity. The mouth is nearly horizontal or curving very slightly npwards at the centre, lips firm, not compressed. Lines of the forehead are not especially conspicuous.

Similarly there are types of facial expression more or less closely associated with esophoria, exophoria, and hyperphoria.

Artificial Maturation of Cataract.—Dr. Joseph A. White, of Richmond, Va., presented his experience in the artificial ripening of cataract by the method of paracentesis and external massage. He reported fifteen cases treated in this way by himself, narrating two in detail, and two treated by his chief of clinic, Dr. John Dunn. None presented any unpleasant sequelæ, and the cataract in each case ripened rapidly, the shortest time being two days, the longest two weeks.

Dr. J. J. Chisholm, of Baltimore, had resorted to the needling of immature cataract with good results, without loss or impairment of any eye by the operation ; the only disadvantage is the tardiness with which the cataract reaches maturity, and if the opening is small very little change occurs in a long time.

Dr. F. C. Hotz had practised artificial ripening of cataract since 1885 or 1886, and, having seen a little unpleasant reaction after Förster's operation, had tried the method described by Dr. White, but his results had not been so favourable. Iritis, and even slight cyclitis, had followed in a few cases, and the result was uncertain. In one case a first operation made no impression, and a second was followed by irido-cyclitis and opacity of the cornea. He was, therefore, more disposed to extract unripe cataracts, and, when a portion of clear cortex remained, thought it safer to evacuate this by a secondary operation than to take the chances of a preliminary artificial ripening.

Dr. A. R. Baker, of Cleveland, had treated three cases by the method described by Dr. White, but there was so much reaction that he was afraid to repeat the operation, and now preferred an early extraction with iridectomy and a peripheral opening in the capsule, and allowing any remaining cortical matter to be absorbed.

Dr. White was sorry to hear of the unfavourable results, but thought they must arise from failure to observe the necessary precautions, especially as to the full dilatation of the pupil.

Treatment of Incipient Cataract.—Dr. A. J. Erwin, of Mansfield, urged that so long as the vision remained about as good as could on the average be expected after cataract extraction every effort should be made to check the progress towards maturity of the cataract, and to get some improvement in vision. He reported a series of cases in which vision had remained unchanged or notably improved under the use of galvanism and the application of tincture of iodine to the lids.

Dr. H. D. Noyes expressed the firm belief that in these cases the improvement of vision is due to a healthier state of the eye, that a careful examination of the natural history

of cataract will convince anyone that there are various stages through which it passes and at which there are changes of vision. At first it is attended by opacities of the vitreous, which later may clear up. Again, there is the failure to discriminate between different forms of cataract; there are some that are likely to remain stationary for many years. This assumption that galvanism, external applications, manipulations, massage, instillations of boro-glyceride, etc., can have any effect in improving vision is founded upon a mistake.

Dr. Randall had followed a series of cases in which swelling of the lens and deterioration of vision were evident, with spicules of opacity encroaching on the pupil, in which the vitreous had cleared, vision improved, and the lens, if not clearing, certainly growing no more opaque, and for a term of years this improvement has remained under treatment of a medicinal character.

Dr. S. D. Risley had reported a series of over one hundred cases, followed during a term of ten or twelve years, in which a large percentage went on to maturity, but many were retarded and still retain useful vision. And even if the onward progress is not arrested by treatment the eyeball is placed in the best possible condition for operation. There is then a field for study in this direction that ought not to be entirely ignored.

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A REPLY TO MR. J. B. STORY AS TO THE CAUSES OF THE LIGHT-STREAK ON RETINAL VESSELS.

BY A. E. DAVIS, A.M., M.D.,

OPHTHALMIC SURGEON, BELLEVUE HOSPITAL, NEW YORK (OUTDOOR DEPARTMENT), ETC.

IN the OPHTHALMIC REVIEW, April, 1892, there appears an article, by Mr. J. B. Story, as to the cause of the light-streak seen upon the retinal vessels, in which he attacks the theory of refraction first brought forward by Loring.

In this paper Mr. Story says "the *true doctrine* has long been before the ophthalmological world, but the *old heresy* appears to be still in existence, if we may judge from the paper published by Davis, which appears in abstract in the OPHTHALMIC REVIEW for 1891, p. 88." In support of "the true doctrine" (reflection) he brings forward no new points, but merely the old arguments of Jaeger (as that observer first thought), and those that Schneller later advanced, in opposition to Loring's theory. As to the experiments of Schneller being a complete refutation of Loring's theory, Mr. Story evidently believes more firmly in them than do most American ophthalmologists. I quote one on this point simply as a representative—Knapp (*Arch. Oph. and Otol.*, IV. 1, p. 147), who has this to say in regard to Schneller's experiments: "Schneller's experiments and statements are in part, at least, as far as can be judged without repeating them, correctly refuted by Loring."

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one of which he thinks disastrous to Loring's theory. These are the movableness of the light-streak on the retinal vessels when the mirror is rotated, the lack of redness of the light-streak, and the absolutely unchanged character of the streak, no matter what the background may be. In each and every one of these points he is, I believe, in error, as I shall show presently.

I have very recently repeated my former experiments with the carmine solution, with but one change in technique from the original experiment, viz., to fill the cylinder with water, as suggested by Mr. Story, so as to have the tube containing the carmine solution surrounded by a medium with the same index of refraction. The results were exactly the same as in my previous experiments with the column of blood from a warm-blooded animal, *i.e.*, in the cylinder with the dark background there was no light-streak, but in the cylinder with the mirror at the bottom there was a light-streak, save where the tube passed over the hole in the mirror. In these last experiments and in the human eye I paid special attention to the first point of objection that Story calls attention to, viz., "the movableness of the light-streak on rotation of the mirror." The light-streak in reality does not move, except very slightly, on rotation of the mirror; the apparent motion is chiefly a narrowing of the streak, the narrowing taking place on one side only—on the side of the vessel from which the light approaches, or on the side opposite to that towards which the light moves.

Now, as to the second point, that "the retinal light-streak is not red, but white," it is to be noted that Otto Becker, many years ago, in his experiments on the mesentery of frogs under the microscope, got a similar light-streak on the mesenteric vessels to that seen on the retinal vessels by ophthalmoscopic examination. Again, in my own recent experiment with the column of blood from warm-blooded animals, where I placed the tube under the microscope with the blood flowing through it

I did not obtain a red light-streak, but an almost pure white one—fully as white as that seen on the retinal vessels. That this light-streak under the microscope was due to *refraction*, and *not to reflection*, there can be no question whatever.

That Mr. Story's third observation concerning the "absolutely unchanged character of the light-streak in the retinal vessels, no matter what the background," is faulty seems, to me at least, too evident to be even pointed out.

To refute this authority I will simply quote here, as I did in my original paper, two cases from Noyes' recent text-book on Diseases of the Eye, p. 50, which bear directly on this point :—

Case 1.—" There was an effusion of blood beneath the choroid, which made a dark patch. This was crossed by a vein, on which no light-streak was present. As the blood-patch became absorbed and a white scleral surface came to view, which was caused by rupture of the choroid, not only did the vessel recover its usual light-streak, but this became more decided than upon the adjacent portions of the vessel. *Case* 2 was one of extreme colloid deposit on the choroid, having all the brilliancy of the most marked patches of fatty degeneration, as found in albuminuric retinitis. This glittering surface was about two discs long and one disc wide, and was behind one of the transverse retinal arteries. As the artery crossed the spot the whole vessel was a bright ribbon of light, the central streak being intensified and widened, so as to equal the diameter of the vessel. On either side of this spot the artery had the usual appearance."

These two cases alone—and there are numbers of others—show how much mistaken Mr. Story is on this point.

Commenting on the above two cases, Noyes concludes :—

"It is therefore evident that the light-streak depends chiefly on the reflecting properties of the surface over which the vessels pass, and on the nature of the blood-column.

That some reflection comes from the surface of the vessel it is true, but it is excessively slight, as proved by my first case, while the blood-patch was fresh and dark. The 'light streak' is, therefore, a phenomenon of refraction and reflection, and the light must pass through the vessel from in front and penetrate to the sclera, to be then reflected from the latter and again acted upon by the blood-vessel, which condenses it into the bright, luminous streak. This is essentially the view first announced by Loring."

So much for the three points of Schneller's, brought forward and supported by Mr. Story. There is, however, a fourth point called attention to in Story's paper, viz.: Schneller's explanation of the absence of the light-streak in detachment of the retina. "Its absence," he says, "in detachment of the retina is due merely to the want of perpendicularity of the vessel to the line of light, not to the alteration of the background." That the absence of the light-streak is *not* due to this cause was proved to me in my last experiment, where I tilted the cylindrical tubes very markedly; but I found that this had hardly any effect on the light-streak, not by any means causing it to disappear. But an experiment is not necessary; for how is it possible for us to see the light-streak on the retinal vessels far forward in the fundus of the eye if it disappears when the vessels are not perpendicular to the line of light? Evidently these vessels, far forward in the fundus, are very oblique to the line of light, nevertheless we see the light-streak on them here just as plainly as when near the optic disc.

If this explanation of want of perpendicularity held good, how was Mr. Story able to see the light-streak on the retinal vessels in his three cases of detachment of the choroidea, which he cites at the close of his paper, and also in the many cases of "obviously detached retina"?

Again, there must be some point of the detached vessels which is perpendicular to the line of light —for instance, the very summit of the bulging

retina. But at this point we do not get a light-streak any more than we do in the oblique portion of the detachment. The only true doctrine of its absence is Loring's explanation, that the underlying fluid absorbs the light before it reaches the underlying tissues, and consequently is not reflected back to the vessel and its contents to be acted upon by refraction so as to cause a light-streak; hence its absence.

And that the light-streak is absent in all cases of well-marked detachment I still claim, and challenge the presentation of a case with as much as ten dioptres of detachment and a light-streak on a vessel at that point. In cases of slight detachment, say, four or five dioptres, there may be a faint light-streak; or, again, at the edge of the detached portion, where it shades off into the normal retina; but this is because the underlying fluid is not of sufficient depth to absorb all the light, but allows enough to go through to cause a faint light-streak.

With reference to the objection to Loring's theory, raised by Donders—namely, that in warm-blooded animals the blood-column was non-transparent, and that in any case, in passing and repassing through the column and undergoing numerous reflections and refractions on both sides of the blood-corpuscles, the light would be rendered totally diffuse and incapable of forming an image—my experiments on warm-blooded animals, already referred to, have shown that in no particular does this objection hold good; the blood-column is, in fact, transparent, and the light is not too diffuse to form an image.

In Story's own experiments he claims that "the light-streak, resembling that in the retinal vessels, is seen just as clearly when the tube passes over a dark background as when it lies on the glass mirror." His observations do not agree with Loring's or mine, and I cannot help thinking he is mistaken. I am also at a total loss to account for the inability of Mr. Story to cause a disappearance of the light-streak on the large veins by

pressure upon the outside of the eye. I have verified this observation again and again.

In conclusion, let me only add that if reflection is the "true doctrine," and refraction is the "old heresy," then most American ophthalmologists are on the side of the old heresy—such men as Roosa, Noyes, Webster, and Knapp, the last named believing that both refraction and reflection play important parts in the production of the light-streak.

AN OPERATION FOR THE RADICAL CURE OF STRICTURE OF THE LACRYMAL DUCT, WITH DESCRIPTION OF A STRICTUROTOME.*

BY CHARLES HERMON THOMAS, M.D., OF PHILADELPHIA.

All who have busied themselves with the surgery of the lacrymal passages must be aware that surgeons have not agreed upon a satisfactory method for the treatment of stricture of the lacrymal duct. With respect to the possibility of radical cure, the attitude of many is one of discouragement—perhaps even of disgust. Of all procedures in use, none is so generally employed as dilation by probes. But the length of time which this method of treatment requires, the amount of trouble it involves, together with the uncertainty of permanent good results—all of which its advocates admit—make it desirable that some more effective procedure be adopted.

Influenced by the results obtained by French surgeons in internal urethrotomy, Stilling, then of Hesse-Cassel, published a brochure in 1868, detailing a new method of treating stricture of the lacrymal

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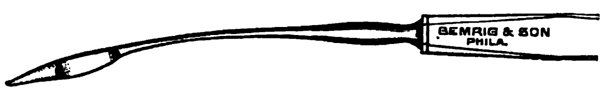
*Read before the American Medical Association, Section of Ophthalmology, 1892.

passages by internal incision, an operation devised by him, and which he was the first to make effective. My attention was at once attracted to this paper. The operation strongly appcaled to me as a good one, and correct in principle. But I believed that the instrument which he proposed was not altogether well adapted to the purpose for which it was intended. In the first place, the knife, being short, straight, and rigid, is not readily, applicable to the bony canal, entrance to which, moreover, is more or less impeded by the overhanging brow —an obstacle which all who have attempted to pass a straight Bowman's probe have doubtless encountered. Then the rounded cutting point and tapering blade—broadest where it joins the shank—make an instrument which one might naturally shrink from introducing into such a passage.

To meet these apparent objections, I devised an instrument which was made for me by J. H. Gemrig & Son, in August, 1869, and which has been subjected to the test of use in my own hands, and some others, during the more than twenty-two years which have followed. The results have been so wholly satisfactory as to lead me to welcome the invitation to present the subject here, especially as I have delayed publishing any account of it till now.

The instrument consists, besides the handle, of shank, blade, and tip. Its length, exclusive of the handle, is 5½ cm. The shank is of untempered steel, to give it



flexibility, and 4 cm. in length. The flexibility of the shank is such as to permit the instrument to be bent into any curve found convenient for introduction into the canal, thus forming a probe, dilator, and knife combined. The cutting blade is 7 mm. in length and 3 mm. in width, the whole terminating in a conical tip, blunt at the point, and equal to the blade in

length. The conical tip serves at once as a guide and a dilator for the cutting blade which follows, and also as a protector of the soft parts during the introduction and withdrawal of the instrument. The handle does not descend below the level of the brow in operating.

A considerable personal experience in urethral surgery, and especially in internal urethrotomy, had prepared me to regard Stilling's insistence on the analogy between stricture of the urethra and of the lacrymal passages as in the main justifiable; and, I may add, as a false passage in the surgery of the urethra is, under all circumstances, to be sedulously avoided, so in the treatment of lacrymal stricture like considerations are applicable, and like care is to be exercised. As in operation for stricture of the urethra by internal urethrotomy incision is properly preceded by dilatation, not as a method of cure, but as a necessary preliminary to the entrance of the cutting instrument into the lumen of the canal, so in incision of strictures of the lacrymal passages like precautions should be taken, allowance being made for the difference of structure in the two cases.

From this point of view Stilling's knife is defective; there is no certainty that its rounded cutting end will enter the narrowed lumen of the duct, and that the downward thrust may not carry it through the tissues alongside of the true passage, and thus force a false one. And a false passage once made, the subsequent incisions taking their start therefrom may result in the formation of a canal whose walls, being devoid of mucous membrane, consist of cicatricial tissue throughout. This danger is obviated by the conical tip of the stricturotome here described, serving, as it does, to guide the blade safely into the duct, and to dilate the strictured part, so as to allow of the blade's easy passage through and beyond it.

From the foregoing it is clear that, while the initial incision with the Stilling knife is necessarily made as a

thrust with a cutting 'pointed instrument without a guide, and is, therefore, to a considerable extent a chance thrust in the dark, the incision with the stricturotome here proposed is a draw-cut from beyond the stricture upward and through it. The incision in the latter case is made at a perfectly definite point of selection—the seat of the stricture—and the instrument is at all times under perfect control, and ready to be used either as an exploring, dilating, or cutting instrument, as the exigencies of the operation may require.

In operating, the first step consists in slitting the canaliculus, the lower if a style is to be used, otherwise the upper. This is accomplished more conveniently with a small grooved director and Beer's knife than with Weber's knife. In making this incision, two points are to be observed: the cut is to be made along the inner edge of the lid, the edge of the knife being directed somewhat backward and towards the eye, so that the groove formed may be in a favourable position to receive the tears; and the opening into the sac must be made sufficiently large to permit the free entrance of the necessary instruments. This latter may be best accomplished with the point of the knife, before the director is withdrawn. An obstructing ledge of tissue is usually found at the inner end of the groove, formed from the lower canaliculus, which offers an impediment to the passage of instruments, and even of tears. This obstruction may be divided later by the stricturotome during its withdrawal at the close of the operation.

A Bowman's probe, or, better still, the flexible probe of Dr. Williams, of Boston, is now to be inserted to explore the canal, and to note the location and calibre of the first stricture encountered. The probe being withdrawn, the stricturotome, well oiled, is introduced, special care being taken to place the point of the instrument within the grasp of the stricture. Strictures impermeable to ordinary probes, and which allow only the passage of an Anel's probe, will be found permeable to the conical

tip of this instrument. The tip being engaged in the stricture, gentle, continuous pressure is to be made, and the cone carried through and beyond the contraction. It cannot be too strongly insisted upon that exploration of strictures in this locality is to be conducted with extreme deliberation and patience; all instruments should be introduced by coaxing, and never by force. More than one sitting may be necessary.

The blade being now caused to engage within the stricture, incision is made completely dividing the tissues at the strictured point, even to the bone, and in at least three different directions. The instrument should then be moved laterally in all directions, to make sure that no narrowing remains ; and before withdrawal it should be carried within the nasal fossa as an exploring instrument, to learn if any other stricture be present, which, if found, should also be incised. By far the most common seat of stricture of these passages is at the junction of the sac and duct ; only occasionally will a stricture be found at the nasal extremity of the duct. A little bleeding at the nose and at the inner canthus is the only external indication that an operation has been performed. The whole operation is singularly free from pain, and with cocaine the pain becomes quite insignificant.

Stilling, and those who have used his instrument, describe more or less considerable hæmorrhage from the nose and ecchymosis of the lower lid as the ordinary results of operation, due, no doubt, to the somewhat extensive and unnecessary cutting of healthy structures, which unavoidably attends the use of such a knife as his, but which conditions do not exist in the operation as here described, the incision being limited to the parts affected.

As regards after-treatment, I have usually introduced a large leaden style, measuring 8 to 10 mm. in circumference, with the upper extremity bent at a right angle, and so reduced in size as to drop into the open groove

formed of the divided lower canaliculus, where it lies concealed. This is removed, at first every day or two, while the passage is washed; after the first ten days it need not be disturbed for a week or more at a time. At the end of a few weeks the style may be removed altogether.

Stilling insists that all after-treatment looking to the mechanical separation of the parts with a view to preserving the space gained by the incision is not only needless, but even harmful, in consequence of the subsequent inflammation said to be thus produced; and he therefore discountenances the use of either probes or styles under such circumstances. With this conclusion, however, my experience does not agree, provided that not a vestige of the stricture remains uncut, and that the passage be so large that the style goes loosely into place. Under these circumstances I have found that the style at least does no harm; while in some instances, where the parts are swollen and the cut surfaces are thus kept in apposition within the bony canal, it is likely to prove effective in keeping the several parts asunder. With patients who cannot be under frequent observation this may prove an important safeguard.

When the style has been removed after several weeks' wear, and when on replacing it, after an interval of a week or two, it is found that it passes without impediment, we are safe in declaring that a cure has been effected. Experience in after-treatment, both with and without the style, leads me to believe that, while success is likely to attend both methods, the use of the style, under the conditions noted, is, on the whole, to be preferred.

In forming an estimate of the relative value of the two methods, dilatation and incision, it is to be observed that by both a permanent enlargement of the calibre of the duct is the object sought to be attained. In both cases increased calibre can be secured only by structural changes in the walls of the duct. But in each, totally

different principles as well as procedures underlie the results aimed at. By the process of probing—gradual dilation—the change is sought to be effected through absorption of the tissues forming the stricture, by means of the pressure of the impinging probe, with a re-disposition of new tissue elements to compensate for the increased size of the duct. Such a process is slow and tedious at the best, and finally uncertain in its results, and for these reasons practically unavailable. Stricturotomy, on the contrary, at once effects an enlargement of the canal, and the "splice" which is formed at the seat of the incision soon fills up the gap, giving the reasonable expectation of the permanent potency of the so-enlarged canal. It may be added that while the canal, as produced by stricturotomy, may be larger than is necessary for the performance of the normal functions of the part, it is certain that the space provided by probing is usually altogether deficient in size. The larger size, in the one instance, however, does no harm, while the small size produced in the other results in the failure of the operation.

In the light of all the facts, I feel warranted in stating my belief that probing as a method of treatment should be discarded. And, also, that stricturotomy, as here described, based as it is upon sound surgical principles and supported by experience, should be substituted for it and all other instrumental procedures now in use for the treatment of stricture of the lacrymal duct. Lacrymal stricture, treated by this method, has, in my hands, during many years, yielded results as satisfactory as those following operation in other parts of the body.

E. FUCHS (Vienna). Pterygium. *Von Graefe's Archiv., Vol.* 38, *part* 2, *p.* 1.

This article is to be considered as the continuation of the work on pinguecula of which an abstract appeared lately in these pages (OPHTH. REV., March, 1892, p. 83). In that paper Fuchs dealt with the causes and nature of pinguecula, and declared pterygium to be a further development of the same morbid process. He now substantiates that position by a minute description of the anatomy and mode of origin and growth of pterygium.

The name pterygium has been applied to two different conditions, which ought to be clearly distinguished: true pterygium and pseudo-pterygium. The former is always situated either on the inner or the outer side of the cornea, and it arises and extends without acute inflammation. The latter may be situated at any part of the cornea; its formation is associated with acute inflammation, *e.g.*, blenorrhœa, burns, and other injuries causing erosion of the surface; it is frequently non-adherent at the limbus of the cornea, so that a probe may be passed beneath it at this point; it does not subsequently advance beyond the point on the cornea to which the original adhesion reaches. Fuchs strictly maintains this distinction. His article is devoted mainly to pterygium proper.

He discusses, in the first place, certain erroneous observations, and the theories founded on them, which have become current in the literature of the subject. Arlt stated that a small ulcer or epithelial defect of the cornea is to be found at the apex of the pterygium, and is the essential starting-point of the disorder. His theory was that a fold of conjunctiva, irritated and swollen through proximity to a marginal ulcer of the cornea, becomes adherent to the latter and drawn over upon the cornea. This hypothesis has to face the difficulty that pterygium is unknown in children, although marginal ulcers of the cornea are particularly frequent at this time of life. Moreover, it does not explain

the advance of the pterygium across the cornea. It has been suggested that irritation and persistent growth might be kept up by accumulation of dust in the groove surrounding the apex which the sweep of the eyelid would fail to remove. One observer declared that a colony of micro-organisms multiplying in the apex of the pterygium was the cause of the advance across the cornea. But Arlt's theory is now, it seems, no longer open to discussion: it is upset by the simple fact that an ulcer of the cornea is non-existent in this disorder. Fuchs examined several hundred cases with special care as to this point, and failed to find the smallest ulceration in any example of true pterygium. He made careful search also for the presence of micro-organisms in microscopic preparations, employing the best staining methods, but found none in any case.

Another hypothesis, based apparently upon a misleading experiment, attributed the formation of pterygium to thrombosis of a vein in the neighbourhood of the corneal margin, but there is no evidence in its favour. One writer has stated that the growth, although adherent to the cornea, is covered even on its under surface by epithelium, and that it is essentially a polypoid tumour of the conjunctiva. Here again the theory was based on faulty observation. Fuchs points out that the under surface of the growth consists of connective tissue continuous with the substance of the cornea.

In view of these faulty observations Fuchs undertook a minute investigation of the matter, for which very ample material was at his disposal. He made observations on several hundred cases. From 50 of the most pronounced cases, of which he made accurate drawings and notes, he obtained the following statistics:—Of the 50 patients, 36 were men and 14 women. The youngest was 21 years old; the average age was 48. In 30 of the cases one eye only was affected, in 20 both eyes. In five cases there were two pterygia in the same eye, one on the inner and one on the outer side; in all the others, where only one pterygium was present, this was seated on the inner side of the cornea. The cases of double pterygium in one eye were probably disproportionately numerous in this group, for Fuchs

selected the 50 cases from a much larger number as possessing specially well-marked characters. For the minute clinical description of the disorder and the elaborate histological details the reader is referred to the original paper. The general outcome of the investigation may be summarised as follows :—

A pterygium is a development of a pinguecula. The pinguecula, which under ordinary circumstances leaves the limbus free, may be seen to gradually invade this latter and advance over it on to the cornea, causing a thickening at the limbus, which subsides somewhat steeply towards the cornea with a convex margin. In this thickened portion the marginal vessels are hidden or obliterated, so that they disappear at a greater distance from the margin of the cornea than elsewhere. In accordance with this mode of origin the situation proper to pterygium corresponds with that of pinguecula, namely, the inner or the outer side of the eye, most commonly the inner, and rather below than above the horizontal meridian. For the same reason the two disorders belong to the same period of life.

During its further growth upon the cornea the pinguecula loses its original characters. The yellow nodules disappear from the pterygium, the advanced margin of which assumes a greyish, brawny look. This margin is never a straight line, but always sinuous or jagged, through a more rapid advance of some portions than of others. The numerous vessels of the pterygium dc not enter this grey margin. In advance of the grey margin the cornea presents numerous minute grey spots or streaks, but no loss of substance. The margin is very intimately incorporated with the subjacent cornea, and the ultimate size, form, and direction of the pterygium are determined by the way in which this closely adherent margin advances across the cornea.

The microscope shows that a pterygium possesses a covering of conjunctival epithelium which has undergone proliferation. Throughout its area of adhesion with the cornea the superficial layer of the latter, Bowman's membrane, is destroyed. Moreover, there is some destruction of Bowman's membrane and loosening of the epithelium in advance of the margin of the pterygium. The relation of

the adherent margin to the corneal tissue varies considerably; sometimes it penetrates the superficial layers in the form of a loose vascular connective tissue, at others it consists of a firm, hard tissue adhering superficially to the undamaged Bowman's membrane. The former appears to indicate the progressive, the latter the stationary, stage of the pterygium. Clinically, the margin presents in the former case a thick, brawny appearance, with a steep subsidence towards the cornea; while in the latter it is thin, tendon-like, and hardly raised above the level of the cornea.

Having described in detail the results of his clinical and microscopic study of the subject, Fuchs discusses the inferences which may be drawn from them. It is evident, in the first place, that the growth of a pterygium across the cornea is something more than a simple extension of a pinguecula, for this would be likely to follow the direction of least resistance in the loose conjunctival tissue, instead of invading the firmer tissue of the cornea; moreover, the structure of the pterygium would resemble that of the pinguecula, which is not the case. What is the significance of the superficial changes in the cornea which are discoverable at and near the limiting margin of the pterygium? They cannot be due merely to the contact of the growth, for they are often separated from it by a narrow line of clear cornea. It appears likely that they represent a failure of nutrition in the cornea due to the neighbouring growth. The cornea receives its nutriment from the capillary plexus at its margin, and any disturbance at the limbus may modify the nutrient fluid. The presence of a pinguecula near to the corneal margin must certainly in some degree modify the nutrition of the cornea, for it involves a marked diminution in the blood-supply. But there is certainly some special change besides the lowering of the capillary circulation, for if it were not so pterygium would be a common consequence of all cicatricial conditions at the corneal margin.

There are certain other conditions in which changes at the limbus certainly modify the nutrition of the cornea. Thus, as shown in Fuchs' previous article on pinguecula, the arcus senilis consists of a hyaline deposit derived from an

altered nutrient fluid secreted at the limbus, and probably indicating atrophic changes in that region. In like manner hypertrophic changes at the limbus, as in spring catarrh and small sarcomata, induce changes in the adjacent cornea. It would appear that a pinguecula near to the corneal margin in some way modifies the lymph which flows thence into the cornea, and thereby leads to a progressive destruction of Bowman's membrane and the sub jacent layers of corneal substance. At the same time a proliferation of connective tissue seems to be excited, so that while the destructive process proceeds around the apex of the growth, cicatrisation follows behind it. As the growth of the pterygium proceeds the characters which belong to the pinguecula gradually disappear, and ultimately, when the pterygium has reached a considerable size, the destructive action upon the corneal tissue appears to be exhausted, the progress is arrested, and a certain amount of atrophy of the new tissue takes place.

Although this explanation is based on minute and extended observation, Fuchs puts it forward as a hypothesis which needs further investigation, especially, when possible, by the histological examination of pterygia in their early stages. P. S.

Haltenhoff. **Keratitis Dendritica or Herpes.** *Annales d'Oculistique, June*, 1892.

The author of this paper gives an interesting brief *résumé* of the chief observations hitherto published regarding this form, or these forms, of corneal disease. He begins by asking the questions—Is there a dendritic keratitis? Does the affection described under this title by Hansen Grut, in 1884, and Emmert, in 1885, deserve a special name; is it not one of the varieties of herpes of the cornea? This inquiry, already discussed by several authors, has recently been the subject of a thesis by E. Hagnauer, written under the supervision of Haab, of Zurich.

Febrile herpes of the cornea was first described by Horner at the Heidelberg Ophthalmological Congress, in 1871. His observations were based upon the records of 31

cases, in 28 of which there was coincident herpes of the nose or lips. All the patients had recently suffered from an inflammatory affection of some part of the respiratory passages.

Horner pointed out the characters which distinguished this febrile herpes from vesicular keratitis (phlyctenular). In 1880, Kendall, a pupil of Horner, published a graduation thesis on "Herpes Corneæ," with observations on a large number of cases; this author, in the main, confirmed Horner's original description.

Haab, who succeeded Horner in the chair of Ophthalmology at Zurich, has further pursued this inquiry. An inaugural thesis by Wangler, 1889, is based upon the study of all cases (150 in number) of febrile herpes corneæ in the Zurich clinique since 1871; a percentage among all cases of 0·37. This seems to indicate that the disease is not so uncommon as is generally supposed; the explanation given by Horner for the rarity with which the condition is diagnosed by most observers is that the patients seldom apply for treatment in the early stage, when the vesicles are visible; and that when they come under the care of the surgeon, only the resulting ulceration of the cornea is evident. Haab states that he has only once had an opportunity of observing perfect vesicles on the cornea. It is not improbable, according to Haltenhoff, that many cases are diagnosed as superficial ulcerative keratitis in which careful examination would have disclosed the special signs of Horner's herpes corneæ. The researches of the Zurich school do not seem to have received the attention they deserve, judging from the infrequency with which herpes of the cornea is mentioned in the statistical tables of Ophthalmic Hospital cliniques. Hagnauer, indeed, complains that during the last decade several writers have described forms of superficial circumscribed keratitis which very probably were unrecognised cases of herpes corneæ.

Hagnauer reports sixteen cases of herpes observed in six weeks in cases of influenza. Several writers (Haab, Fuchs, and others) noted the frequency of this condition in patients suffering from influenza. Haab and Hagnauer made careful observations on these cases, examining the corneæ with

Hartnack's lens, and also by the aid of staining with fluorescine, which latter procedure they strongly recommend.

These two observers hold that the dendriform keratitis of Hansen Grut, Emmert, and others is nothing more than the ulcerative stage of febrile herpes of the cornea. They place in the same category cases of keratitis of malarial origin described by Kipp and van Millingen.

Thus, in accordance with their views, the so-called dendritic keratitis has no place, as a distinct disease ; and the descriptions of the condition to which the name has been given are those of a late stage of the herpes corneæ previously described by Horner.

What is to be said on the other side? When, at the Copenhagen Congress, Hansen Grut first described dendritic keratitis, he was fully cognisant of Horner's writings : "This affection," he remarked, "must not be mistaken for vesicular keratitis . . . It is in no way connected with frontal herpes, nor with herpes accompanying bronchial catarrh or pneumonia, the form so well described by Horner." In a second paper, Hansen Grut carefully differentiates between dendritic keratitis and herpes corneæ ; and says "in the former there is never any question of vesicles, and in no case has there been a previous illness which could have occasioned an herpetic eruption."

Haltenhoff thinks it improbable that an observer such as the Copenhagen professor could have during a number of years failed to recognise herpes corneæ, if, as suggested by the Zurich authors, his dendritic keratitis is one and the same disease.

Haltenhoff reports seven cases of keratitis dendritica which have been under his care since 1886 ; he has also seen cases of true herpes corneæ. He is, however, not prepared to say positively that the diagnosis was correct, as in several instances the conditions corresponded closely with descriptions of herpetic keratitis. In only one of his seven cases was there cutaneous herpes.

It is evident that there may frequently be considerable difficulty in diagnosing between *herpes corneæ* and *keratitis dendritica ;* but, according to our author, it appears more than likely that the two diseases are met with, and that the contention of the Zurich school is not yet proven.

J. B. L.

AMERICAN MEDICAL ASSOCIATION.

SECTION OF OPHTHALMOLOGY.

FORTY-FIFTH ANNUAL MEETING, HELD IN DETROIT, JUNE, 1892.

Chairman, DR. J. L. THOMPSON, of Indianapolis.

(*Continued from p.* 252.)

The Method and Results of Simple Cataract Extraction.—Dr. H. Knapp, of New York, read a paper based upon 683 extractions performed by him in the last six years. Of these 60 were done with iridectomy, 623 without. All cases are included. He considers ripening operations superfluous, and prefers the risk of removing an immature cataract to that of artificial ripening. The patient is operated on in a chair, under aseptic precautions, and when the operation is over he undresses and goes to bed with his eye open. In from five to thirty minutes Dr. Knapp inspects his eye again, and when the wound and iris are all right applies the bandage, which consists of a piece of a moistened corrosive sublimate gauze and absorbent cotton, fastened by two strips of isinglass plaster. Of 125 successive cases treated in that way one showed at the inspection a distorted pupil, which was made round again by stroking the iris back, but the iris subsequently prolapsed. There were also two which showed incarceration of the iris, for which iridectomy was done on the spot, after which recovery was undisturbed.

The most important step in the whole operation is the corneal section. For ordinary cataracts this should comprise half the circumference of the cornea, passing strictly through the transparent margin trespassing on the cornea rather than the sclerotic, and the knife remaining in the same plane from the beginning to the end of its course, the least turning on its axis being carefully avoided. Such sections close and heal admirably. The capsule is opened with a delicate cutting cystotome, behind the iris, parallel to the corneal section ; removal of a piece of the anterior capsule

being confined to the thickening centre of hypermature cataracts.

The results sum up as follows:—Of the last series of 346, 301 were uncomplicated giving failures 4, and 45 complicated giving failures 7. Arranged according to the usual manner there were 84% of good results, 13% moderate, and 3% failures, to which must be added two eyes lost by sympathetic inflammation. The more favourable results of the first series of 300 cases were 94% good, 5% moderate, and 1% failure. Adding these we obtain for the whole series, 89% good results, 9% moderate, and 2% of failures.

Dr. J. J. Chisolm thought the change in Dr. Knapp's practice, in the direction of allowing greater liberty to the patient than he had done in former years, was a subject for congratulation. For the past five years he had himself in at least five hundred cases demanded but little restraint of his cataract patients. They walked from the operating chair to their rooms with the operated eye closed with isinglass plaster, the other being left open for continual use. They sit up and take their meals; and there has been no cause for increasing the restraint. In the work of the last year he had but 9% of prolapses among the cases of simple extraction. He was disposed to believe that if we could succeed in extracting the larger part of the anterior capsule, we avoid the subsequent discission, which, simple as it may seem, necessitates the retaining of the patient under treatment longer than he desires.

Dr. L. Webster Fox, of Philadelphia, exhibited five specimens of black cataract, removed from three patients. The results of two of the operations were fairly satisfactory, the other eyes being subsequently lost by retinal hæmorrhage, iritis, and irido-cyclitis.

Dr. H. D. Noyes asserted that iridectomy was a mutilation of the eye, and he that does it must give a satisfactory reason for it. He was convinced that the essential thing in the extraction of cataract is not so much the precise position, though the limbus is its proper place, as it is the abundant size of the incision.

Dr. Eugene Smith preferred to extract a portion of the anterior capsule, and for this purpose had devised a modifi-

cation of Knapp's forceps in which the teeth were dropped so as better to seize the capsule. He did not find that after the extraction of a piece of the capsule with these forceps there was more frequently iritis or posterior synechia than after simple cystotomy. He considered iridectomy before or at the time of extraction as severe a traumatism as if made subsequently to a simple extraction for prolapse. He would rather permit small portions of cortex to remain than to make repeated attempts at removal. His patients were permitted after the operation to walk about, sit up or lie down as they pleased, in a light room.

Dr. Frothingham desired to give as his reason for iridectomy that with it we can extract the lens through a smaller corneal incision than without it ; and it is yet to be demonstrated that the larger is as safe as the smaller corneal incision.

Dr. Knapp thought all would agree that rest was a prime factor in obtaining primary union. The reason for giving up the roller bandage was that it did not in practice secure such complete rest as was secured without it. As to iridectomy, it is certainly necessary in some cases, for it prevents accidents more serious than the enlargement of the pupil. The danger in the simple operation is from prolapse of the iris, and so it is in the combined operation, and in his experience it is greater in the combined than in the simple operation, and the evidence of this is given by statistics. He would never cut a prolapse unless he could get it fresh. If any infective process is present it is criminal to cut it, as this opens the door for the entrance of germs. Some years ago he made experiments in regard to infective germs, and injected pyogenic germs into the anterior chamber, and found that while the cornea was full of germs the iris was unaffected if not cut. It is a protection to the deeper parts. Here we find a rule for guidance : we should make an iridectomy only when the eye is aseptic and we can make a clean iridectomy.

The occurrence of prolapse is owing to two things—traumatism, and a too peripheral section. In half the cases there was blood on the dressing to indicate that the part had been injured. This is not more likely to happen to

those who are allowed to sit up than to those confined to bed, for it usually occurs during sleep. As to the second cause, iridectomy was adopted originally because Graefe's peripheral section was impossible without it. This is not the case if the section is placed in the limbus, and if we err it should be to place the section in the clear cornea.

Operation for Trichiasis and Distichiasis with the Galvano-Cautery.—Dr. Eugene Smith, of Detroit, has practised such an operation more than fifty times, and found simplicity and efficiency its chief recommendations. A Snellen clamp is placed on the lid, and an incision made with a Beer's knife along the free edge between the normal and the faulty cilia, and carried well beyond the hair follicles, two or three lines deep. The wound usually gapes; but if it does not, the anterior lip may be lifted with forceps and the hair follicles exposed. The hæmorrhage is stopped, and all the hair follicles on the cartilage are gently touched with the galvano-cautery by drawing it from one end of the wound to the other, care being taken to touch only the region of the follicles and not the full width of the wound. A Paquelin cautery may be used. Where a group of faulty cilia are attached to the anterior lip their follicles should also be destroyed.

Congenital Dislocation of the Lenses.—Dr. George Friebis, of Philadephia, reported a case occurring in a boy of seven years. The dislocation was symmetrically upward and inward. The case favoured the theory of heredity as the essential factor in causation.

Dr. D. C. Bryant, of Omaha, had under his care a family of seven, of whom five had dislocation of the lens. In another family the mother and three children suffer with the same trouble. There is no myopia in these cases.

Dr. B. A. Randall had seen two cases in the clinic of Jaeger, who regarded one in which the displacement was symmetrical upward and inward as congenital, and the other, in which it was upward and to the left, as probably traumatic.

Eye Injuries in Relation to Sympathetic Disease.—Dr. T. E. Murrell, of Little Rock, read a paper on this topic. He concluded that, in view of the difficulty of foretelling

the course of an injured eye, and since sympathetic inflammation bore no direct ratio to the extent of the injury, conservatism in dealing with such injuries is dangerous, and permissible only under well-defined rules.

Optico-ciliary Neurotomy.—Dr. J. J. Chisolm, of Baltimore, made a strong plea for this operation as against enucleation in the case of eyes not deformed in appearance, although sightless, and the cause of suffering and danger. In an experience of thirteen years, including eighty-one cases, he had met with none of the dangers some surgeons have experienced. There had not been a single case of jeopardy to life, annoying hæmorrhage, orbital abscess, cellulitis, corneal sloughing, nor, so far as he knew, of atrophy of the globe. He had not been able to trace all these cases after leaving the hospital, but, so far as he knew, only four had subsequently required enucleation. Patients had visited him years after the neurotomy, free from suffering, and with a good-looking eye more valuable than any artificial eye that could have been obtained.

He had early abandoned the ordinary method of operation as one fraught with danger. The cutting of the muscles leads to deformities, and extensive dissections to cellulitis and other complications. He does the operation under general anæsthesia, preferring bromide of ethyl for the promptness and evanescence of its effect. A horizontal snip is made in the conjunctiva parallel with the lower border of the internal rectus muscle, and when the fascia has been freely divided a sharp hook is passed through the wound into the sclerotic. With this the eyeball is rotated strongly outward, bringing the bundle of nerves within easy reach of the enucleation scissors. These are then passed in closed until the nerve is felt. They are then withdrawn until the nerve escapes, and widely opened, the nerve-bundle caught between the blades, and the entire mass divided. The resistance of the optic nerve is readily recognised, and, as a sign that the section has been completed, the scissors will move in all directions behind the eyeball without meeting any resistance. After the division of the ciliary vessels blood escapes into the socket, causing the eye to protrude. To prevent much displacement a com-

press bandage is immediately and firmly applied over the eye, and left in place for twenty-four hours: should firm pressure cause pain, a hypodermic of morphia brings prompt relief. On examination of the eye next day complete anæsthesia of the cornea is evidence that the object of the operation has been accomplished. The patient may be dismissed in a very few days, with only a black eye, due to blood-extravasation.

Dr. Eugene Smith regretted his experience did not correspond with that of Dr. Chisolm: he had abandoned the operation because in almost every instance the eyeball had softened and generally atrophied to such an extent as to cause the patient to prefer an artificial eye.

Dr. Chisolm said, in reply to questions, that these neurotomies were designed for the protection of the patient both from immediate suffering and the danger of sympathetic trouble. These cases belong to both classes—those lost by disease and those lost by accident. There are many cases of small wounds in the cilary region where the eyes would otherwise be condemned to enucleation. The operation is suited to the large class of absolute and painful glaucoma and to some eyes destroyed by irido-choroiditis, and some cases of cyclitis.

Orbital and Ocular Growths.—Dr. Jos. A. White, of Richmond, reported four cases of such growths operated on, two by himself and two by Dr. John Dunn, and presented photomicrographic illustrations and microscopic sections prepared by Dr. Wm. M. Gray, of the Army Medical Museum. The first was a melanotic sarcoma of the choroid, originating in the ciliary body between insertions of the superior and external rectus muscles and extending backward. The second was one of sarcoma of the orbit, originating in the subconjunctival tissue of the lower cul-de-sac, and projecting outward. Although not intimately connected with it, the eyeball had to be removed to get out the tumour. The third was a case of recurrent fibroid of the orbit, extending from the inner and lower orbital edge back to the sphenoidal fissure. The eye, which was perfectly good, had to be sacrificed for the enucleation of the growth, which was only partially successful, as it seemed to pass into the sphenoidal

fissure. The last case was one of a tuberculous tumour of the orbit in a healthy girl sixteen years of age. It was attached to the outer and lower orbital edge, extending backward behind the eye. It was removed, seemingly in its entirety, with preservation of the eye, after freeing its attachments at the orbital edge with the scalpel handie and finger. It was shaped like a compressed pear, about an inch long and three-quarters of an inch wide at its base and tapering to a point with a long cord-like projection where the stem should be. Examination showed it histologically to closely resemble miliary tuberculosis, if not identical with it. The rarity of this kind of tumour, and its development in a young and otherwise healthy girl, gave special interest to the case.

Dr. H. Knapp has found that some benign tumours presented exactly the features of malignant growths. In the case of a patient aged about twenty a tumour deeply situated in the orbit, and supposed to be a sarcoma, completely disappeared. In another case there was considerable exophthalmos from large growths in different parts of the orbit. The eye and tumours were removed by another surgeon, and on microscopical examination the latter were pronounced to be small-celled sarcoma. The patient came two years afterwards with the same condition in the other orbit. There was great protrusion and the masses distinctly perceptible. He could not advise the removal of the second eye, and a year later the growths and the exophthalmos had gradually disappeared, without leaving a trace and without injury to the function of the eye. In another case sent by Dr. Morgan, the tumour sprang from the inner side of the orbit and seemed to be connected with the periosteum. Dr. Morgan removed the growth, and the microscope showed that it was sarcoma. There were similar growths in the nasal passages on that side. In nine months the tumour was as large as before, and seemed to go into the wall of the orbit so deeply that Dr. Knapp did not think any operation could be done with benefit. The patient went to an electrician, and took some remedies. She perfectly recovered. Improvement, she said, began after being four or six weeks under the electrical treatment, and steadily continued. She returned, with the orbit normal and the nasal passages free,

to express her gratitude for the advice not to have it operated on.

What were these tumours that came under the mask of sarcoma, but evidently were not? They were not fibromata, for they did not disappear. The only thing he could imagine was that they were lymphomata. In the first case, the diagnosis of lymphoma was not very difficult, for there were swellings of that nature in other parts of the body. But in the other two cases the disease was purely local, there was nothing to guide to such a diagnosis. The histology of the tumour was in all cases the same—small-celled, with more or less fibrous tissue. If he saw such a tumour certainly not connected with the orbital walls he should hesitate to at once advise its removal.

Dr. R. A. Reeve, of Toronto, had, seventeen years ago, enucleated an eye for sarcoma, and found a firm melanotic tumour occupying a large portion of the vitreous chamber. Two years ago the patient again presented himself. For fifteen years there had been no sign of disease of the orbit. But the patient then had marked cephalalgia and indications of sarcoma of the orbit. He cleaned out the orbit completely and applied chloride of zinc. Microscopical examination showed the tumour to be a melanotic sarcoma. The patient is in good health, with no sign of return of the growth. The cephalalgia disappeared in a few weeks after the operation. He did not consider this a case of true recurrence of sarcoma, but explainable on the hypothesis of abnormal development of embryonic tissue that existed there from the beginning.

Dr. J. J. Chisolm had recently removed an eye in which there was a melanotic growth that proved to be not larger than a pea; and, although pain and injection of the globe had existed but a week, it had infiltrated the sclerotic.

Dr. S. C. Ayres saw, a year ago last March, a patient with a little exophthalmos and vision considerably reduced, and a suspicion of a growth could be felt under the lower lid; ten days later there was perceptible development of the tumour and vision had decreased one-half. Elsewhere an attempt to remove the growth and save the eye was followed by panophthalmitis and recurrence of the tumour. When he came again there were four or five large firm nodules around

the rim of the orbit. After this the tumour did not advance forward, but did so in the direction of the brain. The patient became bedfast, nutrition was seriously impaired, he lost flesh, and in February last had paralysis of the right arm. He died six weeks ago. Post-mortem examination showed that the parietal bone and upper portion of the frontal and occipital bones were softened, and the inner surface of the parietal and both surfaces of the dura mater were covered with a growth looking like granulations. The tumour had not involved the brain, but had simply grown over its anterior surface and pressed it down. The sphenoid bone could be cut with a knife.

Dr. Walter B. Johnson, of Paterson, agreed as to the necessity of careful consideration before removing such tumours, but had recently seen a case in which a month's delay led to alarming increase in the size, and after removal there was prompt recurrence. If operation is desirable it should be done as early as possible. He had removed a number of tumours that had not recurred, one in particular, eight or nine years ago, that was pronounced by Dr. Prudden to be microscopically a myxosarcoma of the optic nerve.

Dr. Geo. E. Frothingham recalled a case of melanotic sarcoma of the choroid that had burst through the sclera; it was removed, and after six or eight years recurred. Then the contents of the orbit were removed, but after four or five years it again returned. As to the malignancy of these growths we have very imperfect knowledge. Some will never recur, while in others the operation seems to stimulate the growth.

Dr. White had seen a case of sarcoma that did not recur. Fibroma, though not ordinarily regarded as malignant, he considered more malignant than ordinary sarcomatous growths, because it almost invariably recurs. He had seen three cases of fibroma, and all recurred. It is difficult to determine how much of the fibrous change has taken place in certain tissues, because of the slight difference microscopically from the normal appearance.

Etiological Relation of Nasal Diseases to Affections of the Eyes.—Dr. H. Gradle, of Chicago, stated that, in proof that certain ocular affections are the result of nasal disease,

we can observe the extension of nasal disease into the orbit and appendages of the eye, we may find clinically certain eye diseases occurring so regularly in connection with nasal affections as to suggest the dependence of the former upon the latter, or we may be able to influence the course of eye diseases by nasal treatment. American authors have dwelt mainly on eye symptoms of nasal origin; but there are besides actual eye diseases with visible lesions the etiology of which must be sought in the nose. Nasal origin has been proved in the following instances:—1. Diseases of the tear passages, in the majority of cases, besides mere reflex lacrymation. 2. Vascular disturbances of the lids, varying from œdema to an erysipelatoid condition; certain cases of blepharitis. 3. Conjunctival congestion and indirectly chronic catarrh, and certain forms of acute conjunctivitis accompanying coryza. 4. The dependence of some forms of corneal disease upon nasal disturbances is probable but not distinctly proven. The author's experience referred to phlyctenular disease, and to a sclerosing form of fasicular keratitis. 5. Some attacks of iritis. 6. An ill-defined disease suggesting glaucoma, characterised by reduction of sight, visual field, and accommodation, with intraocular congestion. 7. The optic nerves may become involved by extension of disease from the sphenoidal sinus. 8. Some of the peripheral forms of paralysis of the ocular muscles. 9. Some inflammations of the orbit, and some orbital tumours originate in disease of the nose or accessory sinuses. Exophthalmic goitre has in a few rare instances been cured by intra-nasal treatment. 10. The most frequent ocular troubles of nasal origin are the functional derangements, such as itching and burning of the lids, a feeling of fulness and shooting pains, and less commonly aching. With these annoyances there may or not be asthenopia. The latter depends generally on intraocular causes, but cases of purely nasal origin also occur. Other functional disturbances which can sometimes be traced to the nose as their starting-point are fugitive scotoma, blepharospasm, and chorea of the lids.

CORRESPONDENCE.

To the Editor of The Ophthalmic Review.

Sir,—I feel sure that those who have perused the report lately issued by a committee of the Royal Society on the subject of colour-vision will agree in thinking that it is at once a clear and admirable report, and probably the best guide we have to the rapid and sure diagnosis of this condition. Without doubt the recommendation by the committee of Holmgren's wools is most judicious, for this test is, of those easy of application, one of the most certain. At the same time the coloured-letter test devised by Stilling has always given me excellent and rapid results, and Donders regarded it as one of the best in existence; if possible, it is more easily applicable than that of Holmgren. For scientific purposes the spectroscope is, of course, the only test available. To me this instrument, as used by Donders, has always seemed, for physiological investigation, all that could be desired. During the spring of 1882 I had an opportunity of using it under his direction in the laboratory at Utrecht. As is well known, Donders used two spectra, the one superimposed on the other, and so arranged that the one was freely movable above the other. By means of a diaphragm it was possible to isolate any narrow band of one spectrum and compare it with a narrow band of the other. Thus the examiner could at will have, say, a narrow band of the red of the one spectrum as the test and superimpose above it narrow bands of any colour he liked of the other. Further, by altering the amount of light coming into each spectroscope, the saturation of these narrow bands could be altered at will. Such was the apparatus which Donders always used for his physiological investigations.

There seems to me, however, one very important omission from this report, and that is that there is no

recommendation as to the necessity of testing the light-sense, at least in the case of sailors. For certain classes of seamen I have always thought this to be a matter of quite as great importance as the testing of the colour and form senses. It is of special importance for those engaged in the coasting trade, and for those who are acting as pilots, that their light-sense should be most thoroughly tested. I remember on one occasion, when coming into the Clyde from the western ocean, that the captain and two of the officers were engaged, on a very thick day, in trying to "pick up" the Irish land. The captain and one of the officers saw it, but the other officer entirely failed. I remember also one foggy night that the engineer was the only person on board, or at least on deck at the time, who saw the loom of the light on Tory Island. Now, so far as I know, the instances on record of a vessel being lost from colour defects in those in charge are very few in number, yet a wreck from a coast-line not being seen is a matter of almost daily occurrence, and it is highly probable that many of these disasters may be due to a defect in the light-sense.

The committee of the Royal Society think that at present our information is defective as to accidents due to colour-blindness, and there is no doubt as to the correctness of that conclusion. As an actual fact there was no instance of such a mishap brought before them, with the doubtful exception of the *Iron Duke*.

How the light-sense can best and most rapidly be tested is, perhaps, a matter which still requires investigation. The conditions which any test must fulfil are accuracy of result and ease of application, especially where a large number of men is to be examined. So far as I know at present, the test-types of Bjerrum are those best adapted to test the light-sense; moreover, they are, at the same time, the most delicate test for the form-sense.

The committee seem to be of opinion that a man need not be prevented from going to sea who is colour-blind, unless he is to be employed in some capacity or other in which the defect would be dangerous. Thus it appears that colour-blindness would be no obstacle to a person being employed as a steward, a cook, a domestic, or a stoker, or, for

that matter, as a marine or a bluejacket, provided he had not to keep watch.

A further hint thrown out by the committee is that the experts, to whom a final appeal might be allowed, and who should inspect the tests from time to time, should be ophthalmic surgeons. But I would respectfully suggest that these experts should themselves be thoroughly tested as to their colour-sense. Moreover, no one should be appointed, as a final opinion, unless he can show evidence of having a tolerably wide acquaintance with colour as a branch of physical science. No doubt most of our modern ophthalmologists have a competent knowledge of physics, but that in a few exceptional cases it is absent is shown by the fact that not long ago an ophthalmic surgeon was seen taking a perimetric tracing with the patient's eye at least three inches behind the centre of curvature of the arc of his perimeter. Any ordinary examiner of the Board of Trade could certainly make as good an examination as a surgeon devoid of a thorough knowledge of the physics of colour.

I am, Sir, Yours truly,

FREELAND FERGUS,
Surgeon Glasgow Eye Infirmary.

Aug. 1, 1892.

INJURY OF THE LENS, WITH CASES.*

By B. L. Millikin, M.D., Cleveland, Ohio.

From a clinical standpoint injuries of the lens may be divided into two classes: first, those where the chief injury is to the lens-mass itself; and, second, where there is, in addition, a grave lesion of other structures of the eyeball, the latter comprising a much larger proportion of all the cases with which we meet.

In the first class are such injuries as are due to bits of steel or iron lodging in the lens-substance, spicules of iron penetrating but not remaining in the cornea and lens, etc., these producing very different lesions according to their size, form, and the force with which they enter the eye. If these penetrate the lens and enter the vitreous another class of complications arises, depending upon the ultimate lodgment of the foreign body. The second class comprises a series of injuries of great importance and variety, the most serious being those associated with injuries to the ciliary body. And the results will depend materially upon whether the foreign body remains in the eye or not; the age of the patient also affects directly the result of all injuries.

Most injuries of the lens are liable to terminate in traumatic cataract more or less complete according to the extent of the lesion of the lens or capsule. In the early history of injuries the diagnosis is usually easy,

* Read before the Section on Ophthalmology of the American Medical Association.

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but with injuries of the iris and ciliary body in addition the location is difficult or impossible, on account of hæmorrhage and other disturbances. Within a day or two the line of opacity through the lens will suffice to show readily the course of the penetrating body. The rapidity of the development of traumatic cataract will depend upon the extent of the lesion of the lens, and especially of the capsule. Very frequently opaque portions of the lens change rapidly, and considerable areas will be absorbed in a short time. Sometimes a line of opacity will disappear entirely, leaving the lens-matter quite clear, while again such a line will remain for years, marking the course of a penetrating body, and, if near the periphery, will not interfere with vision.

Six cases are reported in outline as illustrating the characters and progress by the various classes of cases.

Case I.—Spicule of iron penetrating the cornea, iris, and lens, showing within a few days an opaque line at point of entrance to lens, which shortly cleared completely, leaving no trace of injury ; vision remained normal.

Case II.—Fragment of musket-cap penetrated the cornea, iris, and lens, lodging in vitreous-chamber, and leaving, after twenty years, an opaque line through the body of lens ; vision was fairly good.

Case III.—Explosion of powder in face, a grain penetrating the cornea and injuring the capsule and lens ; this was followed by opacity of the lens over a considerable area, which ultimately cleared, leaving an opaque spot on the lens and vision nearly normal.

Case IV.—A young lady, of 20, was struck in right eye by a part of a wire fence ; there was an irregular wound of the cornea and capsule of lens, and some escape of lens-matter into the anterior chamber, with immediate loss of vision. The pupil was kept dilated with atropia. The lens-matter in the anterior chamber was rapidly absorbed, and the opacity in the lens, at first quite extensive like the

spokes of a wheel, gradually cleared till the patient could count fingers at eight feet.

Later, vision failed, probably owing to re-development of cataract.

CASE V.—Injuries to both eyes at considerable intervals. (1.) A man, aged 21, was struck on the left eye by an iron bar, which produced a linear wound of the cornea and injury to the capsule; lens-matter escaped into the anterior chamber. By operation the opaque lens-material was removed, and by a second operation the capsule was slit, with favourable results. (2.) A year later the right eye was struck by a bit of steel, which caused a wound of the corneo-scleral junction at the lower outer quadrant, and the anterior chamber filled with blood. Three days afterwards examination with oblique light showed striæ of the lens. Evidently traumatic cataract was developing rapidly. A month later the irritation had greatly subsided, the pupil was irregular in shape, with attachments of the iris in wounded region; the middle portion of lens was clearer, but with more dense opacity directly behind the seat of injury. Two weeks later the central lens portion had entirely cleared, and the opacity was confined to the neighbourhood of injury. After nine months sight failed, and the patient could count fingers at six feet only, cataract involving later almost the whole of the lens.

CASE VI.—A man, aged 25, was struck in the left eye by a small piece of steel. Feeling no pain, and supposing the steel had not entered the eye, he continued to work, though all day he was unable to see with the injured eye. Shortly after, opaque lens-matter was removed by operation, but patient has been sightless, except for bare outlines of objects. Pupil is now fairly clear, cornea irregularly scarred, iris adherent above, and with ophthalmoscope the deep structures of the eye are invisible, owing to dense opacity of the vitreous. Eyes are sensitive and liable to further trouble, owing, presumably, to the foreign body being still present.

There are few lens injuries which do not leave some permanent damage. The first requisite for both young

and old is removal of the offending body when possible, then cleanliness by aseptic or antiseptic washes.

The great danger when the injury involves the iris is plastic adhesion of the iris to the lens.

Atropia sufficiently strong to thoroughly dilate the pupil and keep the iris out of harm's way is most valuable. For the young there is little danger of glaucomatous symptoms. When such occur the increased tension may be avoided by emptying the anterior chamber.

The cataractous condition is perhaps partly due in these cases to unwise use of the organ where it should rest indefinitely. Bandages need to be employed usually only till the external wound is healed, unless hæmorrhage requires their moderate pressure. Alternate use of atropia and eserine is efficient in iritic attachment cases.

E. JAVAL (Paris). **On Binocular vision in its relation to Strabismus.** *Article VIII. in the Helmholtz Festschrift.*

This article is a concise and lucid recapitulation of the author's well-known researches in the physiology of binocular vision, with special reference to the study of strabismus. The various aspects of the subject are dealt with severally in a series of short sections.

1. *We see Single with the Two Eyes together.*—This fact, although it has received various fantastic explanations, is merely one example of the general law applying to all the senses, by which, as the result of education beginning in earliest infancy, we are able to interpret our sensations so as to obtain the truest possible representation of the objects which produce them. The young infant is an indefatigable experimenter. The separate sensations excited by a single object in several fingers at the same time he

soon learns to refer to a single object; the impressions produced in his two ears by the same sound, or in his two eyes by the same object, he learns, in like manner, to refer to a single source. According to the Darwinian principle, the experience of preceding generations abridges the amount of experimentation through which each infant must pass.

2. *We can Distinguish between the Sensations received by the Two Eyes respectively.*—Between the sense of touch and the two other senses by which we ascertain the position of objects there is an important difference: when we touch an object we know what part of our skin receives the impression, but we see and hear without any knowledge of the arrangement of the nerve-endings which are concerned. It would appear at first glance that we make no distinction between the impressions received by the right and left organs respectively, but as a fact we do distinguish between them, though for the most part unconsciously, and in this distinction lies the essential advantage of binaural hearing and binocular vision. Thus the direction whence a sound comes is revealed by the different intensities of the sensations perceived by the two ears; in trying to judge the direction accurately, we instinctively turn the head from side to side, so as to vary the relative intensity of the two impressions. If all movement of the head be avoided it is hardly possible, for example, to determine whether the sound of a piano in another chamber comes from the story above or the story below that in which the listener stands.

Similarly, our power of distinguishing between the sensations received by the two eyes in the act of binocular vision, though it is used unconsciously, enables us to appreciate solidity or relief in the object looked at. Many instances of the power of dissociating the two visual impressions may be given. For example: a person who habitually wears glasses can at once refer to the right or the left glass, as the case may be, any temporary obscurity thereon which impedes his vision. The phenomenon of binocular lustre is of the same kind. A patient of Javal's in whom binocular vision had been recovered by systematic exercises could,

when using the stereoscope, immediately determine upon which of the two pictures a spot had been made.

3. *Physiological Diplopia.*—Since binocular single vision is acquired by habit, double vision naturally occurs when the habitual manner of directing the eyes is violated. An analogous false impression is received through the sense of touch when two fingers of one hand are crossed and then applied to a single object. Physiological diplopia may be induced in many ways which are well known: for example, by slightly displacing one of the eyes by the pressure of the finger, or by placing a prism before one or other eye. Moreover, by a special effort of the attention we can convince ourselves that, while we see single as regards the object at which we look, we see double, though unconsciously, as regards objects at greater and smaller distances. The easiest way to investigate this phenomenon is to place two lighted candles upon the table, one farther away than the other, and to place a red glass before one eye. Then, on looking at the nearer candle, we have diplopia as regards the farther one, the images being direct or homonymous; on looking at the further candle we have diplopia, with crossed images, as regards the nearer one.

4. *Fixation.*—The normal double images just referred to are perceived with difficulty, for we habitually direct the eyes to the object which holds our attention, and therefore in trying to perceive the double images of any object we are apt to direct the eyes towards that object and thereby abolish the double images. The precision with which the eyes are directed to the point on which the attention is fixed is very great. Thus, however closely two minute points may be approximated, an experienced observer has no difficulty in saying which of the two he is fixing at a given moment; indeed, the area in the visual field occupied by the true fixation-point hardly exceeds that of the smallest visible point. Now the region of the retina which is endowed with maximum acuteness of vision is much larger than that of the true fixation-point, as is proved, for example, by the fact, well known to astronomers, that the scrutiny of very minute stars is aided by slight movements of the eyes. If our vision were uniocular, therefore, the fixation-point,

as distinguished from the area of maximum acuteness of vision, would have no obvious value; it is in relation to binocular vision that its value is apparent. Without such a precise point from which to co-ordinate the two retinal pictures, accurate binocular vision, as we know it, could not be achieved. It appears likely that the subjective development of the idea of this precise fixation-point is one of the difficulties which impede the recovery of binocular vision in those adults whose strabismus dates from earliest infancy. It is possible that the want of the precise idea of fixation is the cause of that trembling of the images which is sometimes complained of even when single vision seems to have been almost completely restored.

5. *Fusion of Images.*—As already said, the ability to combine two distinct impressions in one mental picture is the result of education. By means of constant practice the infant learns to combine the pictures received by his two retinæ, and thus to banish the double vision which attends his first visual efforts. No one can say with certainty whether a new-born infant squints or not. He passes through a period of uncertain fixation, which lasts some days or weeks. Even when the eye-muscles have not at first absolutely correct dimensions use develops them—"the function makes the organ"—and binocular vision is established. True congenital strabismus is very rare. In those patients who are said to have always squinted we can generally ascertain that vision was kept in abeyance by an ophthalmia in the earliest months of life, when the muscles of the eye should have been acquiring their normal development and function. In the adult the desire for fusion is so strong, through long habit, that he instantly overcomes an exceptional difficulty such as may be artificially created by presenting to him in the stereoscope two pictures more dissimilar than those which are ever presented under normal conditions, or by placing a weak prism before one of his eyes. On the other hand, the study of strabismus shows that in a person deprived of binocular vision during many years the tendency to fusion is abolished, and may even be replaced by an aversion to single binocular vision.

6. *Suppression (Neutralisation) of Visual Sensations.*—

By education we acquire, in addition to the faculty of fusion, that of suppression of retinal impressions—the ignoring of certain impressions which are detrimental to true perception, especially in binocular vision. The sense of hearing again supplies analogies. The author tells us how, when a child attending a concert for the first time, his attention was laid hold of by the scraping of the fiddle-bows and the crowd of other unmusical sounds which proceed from a great orchestra, whereas now he must make a strong effort in order to hear anything else than the grand harmony. In like manner we are able to neglect many of the impressions received by our eyes, indeed it needs the talent of a Purkinje to observe the existence of the entoptic phenomena which occupy a considerable area in the retina. By this acquired power of suppression the microscopist and the sportsman are able to use one eye only and yet to keep the other eye open.

The suppression of sensations may be of various degrees of completeness. Thus a listener at a concert may, while conversing with his neighbour, completely ignore the music, yet will hear perfectly an unexpected noise or an unexpected silence in the orchestra. In like manner the microscopist while using his right eye may see nothing with his left, and yet will immediately perceive the movement of a light or other object near his instrument.

Suppression is carried to an extreme in cases of strabismus and constitutes the chief difficulty in the cure of this disorder. The majority of strabismic persons do not see double, thanks to the suppression of a large part of the impression received by the deviating eye; and yet this eye continues to be used in indirect vision, and immediately recovers its sensibility over the whole field when the fixing eye is covered. Such suppression continued many years leads, in certain cases of unilateral strabismus, to permanent deterioration and loss of fixation-power. The proof that the deterioration is a consequence and not a cause of the strabismus is found in the fact that it is never met with where the deviation is recent, and that it is nevertheless sometimes present in cases which do not date from early infancy. Moreover, fixation-power and normal acuteness

are sometimes recovered by amblyopic eyes of this kind. The study of strabismus and its treatment by educating exercises has thrown much light on the phenomena of suppression and their relation to binocular vision.

7. *The Eyes are in a State of Continual Movement.*—When the eyes appear to be looking fixedly at an object, they are in reality making a succession of minute movements; they feel the object, as it were, by travelling over its surface. This fact is well known to photographers. Excursions of the eyes, as in reading or in looking from one part of the landscape to another, are not made, as might be supposed, by smooth, unbroken movements, but by a succession of short movements and pauses. Thus, according to its length, the reader divides the line into five or six segments, on each one of which the eyes are momentarily arrested in succession. The study of after-images—as, for example, those of the setting sun when the eyes travel along the horizon—proves the interrupted character of such movements.

Again, the positions which the eyes hold in relation to each other are constantly changed in looking from one object to another. A good idea of the need for such movements may be obtained by studying the want of coincidence between the two parts of a stereoscopic photograph. Superimposing the two pictures and viewing them by transmitted light, we find that only those points which are equally distant from the spectator can be made to coincide. In order to obtain coincidence of points situated in a more distant or a nearer plane, a displacement of the one picture upon the other is necessary.

8. *Perception and Measure of Relief.*—According to a well-known experiment, when the eyes are fixed upon a luminous point in a dark box and a spark is caused to appear for a minute fraction of a second at some other point in the box, we can usually say with certainty whether the spark was nearer to or farther from the observer than the point to which his eyes were directed. This judgment depends upon the positions of the double images of the spark, whether crossed or homonymous, and the faculty of distinguishing which of the two images belongs to which eye.

This experiment illustrates the manner in which our ideas of relief are obtained under ordinary circumstances. But, according to Javal, a distinction must be made between the mere perception and the measurement of relief—in other words, between the qualitative and the quantitative estimate of the third dimension. The latter depends largely upon movements of the eyes, and especially upon differences of movement in the two eyes respectively. The following may be taken as the simplest illustration: Imagine a straight line lying in front of the observer and in the same horizontal plane as his eyes, its left extremity nearer to him than its right. Now if the two eyes be fixed first upon the left extremity and then upon the right, the excursion involves a smaller movement in the left eye than in the right. The stereoscopic pictures presented to the two eyes are simply two straight lines, the left shorter than the right. The estimate of the relative distances of the two extremities of the line depends, according to Javal, on the difference of movement above mentioned.

9. *Adjuvants in the Perception of Relief.*—Javal has studied these auxiliaries in a number of strabismic persons who could compare their recently-acquired binocular vision with the uniocular vision to which they had been previously limited. Moreover, unfortunately, the loss of one of his own eyes, after the enjoyment of perfect binocular vision for nearly 50 years, enabled him to study the subject in his own person.

The one-eyed man, having no binocular parallax, will sometimes learn to substitute for it the variations of parallax which are obtained on making small movements of the head. He will also aid his judgment by especial observation of the shades and cast shadows of objects. Javal himself in using an instrument upon the cornea—as, for example, in removing a foreign body—notes the moment at which the point of his needle comes in contact with its corneal image. Such shades, shadows, and reflections play an important part in all pictures and photographs, but to the two-eyed man they do not convey a real sense of solidity or relief, because his binocular vision tells him that all points of the picture lie in the same plane. The idea of relief is at once

increased when one eye is closed and the head kept motionless. Certain of the well-known enclosed pictures in the Wiertz Museum, in Brussels, give striking illustration of this.

A most important adjuvant in the case of binocular vision is the faculty of suppression or neutralisation. In looking at a near object the two eyes receive different pictures, but by the fusion of the two pictures a single true impression is produced. This implies the suppression of a part of each picture. As a rule we neutralise in each picture those parts which occupy a smaller area than is occupied by the corresponding parts in the other picture.

10. *Relation between Convergence and Accommodation.*— It would seem that the accommodation plays an unimportant part in our perception of relief, for in viewing a stereoscopic slide which gives us a perfect idea of relief the accommodation does not vary. The normal association of accommodation with convergence is by no means invariable. A little practice suffices to dissociate the two acts to a large extent. Thus, one can learn to look with parallel axes at a stereoscopic slide so as to fuse the two pictures, and yet to accommodate both eyes for the necessary near points. This power of dissociation is practised constantly by those myopes who make intermittent use of concave glasses. It is present also in those hypermetropic strabismics who can accommodate correctly for a distant object without deviation of either eye, but who squint strongly every time they accommodate for a near point. The cure of such cases is obtained by means of a sliding stereoscope by which the patients are taught to accommodate without converging.

11. *Imperfect Binocular Vision.*—Between perfect binocular vision and its total absence there are many intermediate conditions. Degrees of anisometropia which suffice to impair the perfect perception of relief are compatible nevertheless with some of the advantages of binocular vision. On the other hand, while an imperfect eye may aid its fellow considerably in the estimation of solidity, it may be a positive hindrance in reading, where the perception of the third dimension plays no part, and the imperfect image received by the inferior eye may be a source of confusion.

Hence the tendency to divergent strabismus under these circumstances. Each individual learns to use his organs in the best way which their imperfections will permit of. Javal contrasts the effects of anisometropia in painters and sculptors respectively. The painter, being concerned with a plane surface, is less troubled by an impairment of the retinal picture in one of his eyes than the sculptor, who needs a fine perception of solidity, and he is more likely than the sculptor to object to the correction of his anisometropia. Javal's personal experience in this connection is significant. He tells us that while he still enjoyed perfect binocular vision, he was far more sensitive to the beauties of sculpture, and cared less for pictures, than at present.

12. *Incongruous Strabismus.*—In the exceptional cases to which this name is given there is what has been called a condition of false projection. When, by the use of a coloured glass or the stereoscope, the patient becomes aware of double images, the position of the false image is not in accordance with the rule; it stands near to the true image instead of presenting a displacement corresponding with the deviation of the eye; and when the deviation has been corrected by a tenotomy, the false image then shows a wide displacement instead of a fusion with the true image. Speaking strictly, the projection in such a case of strabismus is not false, but true, for the squinting eye projects the image to its true position. Such cases are compatible with the theory of the existence of identical points in the two retinæ, but they show that the position of corresponding points is not necessarily the same in all eyes; in other words, that the correspondence is empirical, and can be modified by education under exceptional circumstances. In these cases of incongruous strabismus there is, however, no true fusion of the two images.

13. *Tests of Binocular Vision.*—Many persons who do not enjoy true binocular vision have no suspicion of its absence. The matter may be tested in many ways. In the article before us a number of figures are given for use with the stereoscope. The individual who enjoys true binocular vision will combine the two pictures in each case, and thereby obtain an idea of solidity or other binocular effect

which will be entirely absent in the case of the person who fails to fuse the pictures. Some new tests are also given. The simplest amongst these, perhaps, is one which consists in presenting to the two eyes—in a box somewhat resembling a stereoscope, but without the central division—a concave surface which carries a series of elevations resembling the teeth of a cog-wheel. The observer sees the face of each tooth and the surfaces between the teeth with both eyes; but he sees the sides of the teeth with only one eye, the right sides with the one, the left sides with the other. Letters are drawn upon the faces of the teeth, upon their sides, and upon the intervening spaces; certain of these letters, therefore, are seen with both eyes, others with only one, and it therefore becomes at once apparent whether the observer uses both eyes simultaneously or not.

Javal concludes by urging that the stereoscope, on the invention of which Wheatstone prided himself more highly than on that of the electric telegraph, is capable of rendering the greatest service in the cure of certain cases of strabismus which are often considered to be incurable, and that it is a valuable aid in the treatment of those cases which are curable by other means. He points out also that the study of the phenomena of strabismus has done much to elucidate the physiology of binocular vision.

P. S.

R. L. RANDOLPH (Baltimore). **A Valuable Experiment bearing upon Sympathetic Ophthalmia with a Critical Review of the Subject.** *Archives of Ophthalmology, July*, 1892.

The author reports a case in which the conditions were unusually favourable for testing the truth of the infectious origin of sympathetic ophthalmitis. The clinical records, though incomplete, together with the laboratory experiments made in connection with the case, form an interesting addition to the literature of the subject. The notes of the case here given are to a considerable extent a verbatim copy of the original.

J. M., 41, farmer, was struck on the right eye by a chip from a pick-axe on June 1, 1891. He was not conscious of pain at the time, and kept on at his work, though seeing very indistinctly with the wounded eye. Three days later he gave up work on account of pain and dimness of sight; on the fifth day he came to the hospital. There was then only light perception in the right eye, which was very sensitive to the touch. He remained in hospital only three days, and left with directions as to the treatment he was to follow, and with the understanding that he should return if pain persisted. After he had been at home six weeks, with continual pain, the left eye began to show signs of sympathy, photophobia, lacrymation, and dimness of vision. He was treated by his family doctor with blisters and cold applications to the eye, and sight improved. On August 13 he came again to the hospital, and the following conditions were noted :—

Right (wounded) eye: No perception of light, globe very tender; at the site of the wound (which was presumably in the ciliary region, although its position is not stated) the sclera was injected, cornea clear, pupillary margin of iris adherent to lens capsule. Left (sympathising) eye : V.$=\frac{10}{200}$; abundant inflammatory deposits on anterior lens capsule, with numerous evidences of old iritis all round the pupillary

margin. The fundus was very indistinctly visible. The patient complained of great pain in the forehead and the region "behind the nose."

The injured eye was enucleated, careful preparations having been made for carrying out culture and inoculation experiments. A point at the sclero-corneal junction close to the wound was sterilised by a hot knife, and a sterilised spade-knife passed into the anterior chamber and withdrawn. A platinum wire loop was introduced through this incision, stirred about in the anterior and posterior chambers, and with it *smear* cultures on agar and three Esmarch tubes were prepared. These tubes were subjected to the proper temperature in an oven for as long as ten days, and not a sign of growth showed itself. Cover-glass preparations were made from the vitreous and aqueous chambers, but no organisms were found.

A rabbit was then obtained, and a small opening made into the anterior chamber of one eye with a sterilised knife. A piece of iris taken from the enucleated eye was introduced through this incision, moved about in the anterior chamber, partly drawn out and left. The tissues about the incision were intentionally bruised during the operation in order to imitate the conditions peculiar to a penetrating wound of the eye. In one week's time, with the exception of a slight blush about the wound, the rabbit's eye showed no evidence of disease ; in two weeks this injection had entirely faded away, and only a slight prolapse of the iris gave any evidence of the operation. The cornea remained clear throughout.

The earlier experiments of Deutschmann * regarding the pathogenesis of sympathetic ophthalmitis were made with the spores of the aspergillus fumigatus, which were injected repeatedly into the vitreous of a rabbit's eye. Choroido-iritis ensued, and at the end of four weeks or thereabouts choroido-iritis and vitreous opacities were found in the fellow eye. The rabbit having been killed, microscopic examination confirmed the diagnosis, and gave evidence of interstitial inflammation of the optic nerve (of the injected

* See OPHTH. REV., vol. II. p. 22, and vol. III. p. 304.

eye) extending up to and involving the chiasma, and passing down the optic nerve on the opposite side. Deutschmann concluded, therefore, that a sympathetic inflammation may be produced in one eye by the introduction of infectious matter into the other, and that the tract of this inflammation is along the optic nerve and its sheaths. Inasmuch as he regarded the inflammation excited by the aspergillus injections as the result of chemical irritation, and, knowing that such irritation is rarely, if ever, concerned in the production of sympathetic inflammation, he resorted to the pus-organism for the inoculating material. He injected two or three drops of a suspension of staphylococcus aureus into the vitreous of one eye, resulting in the death of the animal from meningitis on the third day. By using a more dilute suspension of the same microbe for injection he avoided meningitis, but four out of five rabbits died of general infection at varying periods after inoculation. On microscopic examination round-cell infiltration, with micrococci, was present in both optic nerves, in the chiasma, and in the posterior half of the second eye. No invasion of the iris and ciliary region of the second eye occurred; the absence of this was thought to be explained by the death of the animal before the organisms had time to reach the anterior part of the eye.

The nature of sympathetic ophthalmitis has always been a topic of discussion among ophthalmologists; the appearance of Deutschmann's work in 1882, with the record of several experiments, each of which confirmed the previous one, seemed to so satisfactorily dispose of the difficulties surrounding the subject that his views were very generally accepted.

The striking and uniform results he obtained promised to be easy of confirmation by other experimenters; this, however, is the reverse of what has actually occurred. Gifford,* when working in Horner's clinique, repeated Deutschmann's experiments on seventeen rabbits, but entirely failed to obtain like results.

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* *Archives of Ophthal.*, Vol. XV. p. 281, and OPH. REV. 1886, p. 284.

Randolph,* eighteen months later, began a series of experiments on the same lines, the records of which he published three years ago. He at first used dogs as subjects, thinking they would be less likely to succumb to the effects of general infection; none of the animals, with one exception, showed any evidence of constitutional disturbance. He then repeated the experiments, using rabbits. In all, thirty experiments were made, and in every instance they failed to verify Deutschmann's results.

Mazza, and later Limbourg and Levy, experimented upon rabbits and guinea-pigs, and their results were confirmatory of those of Gifford and Randolph, and contrary to those of Deutschmann.

As regards the discovery of micro-organisms in an eye which has been removed for fear of sympathetic disease in its fellow, experience differs widely. Deutschmann rarely failed to find micro-organisms in such eyes; Randolph, in a score of eyes, has only once detected microbes, in a case in which the injury occurred only two weeks before the eye was removed. Ohlmann (*Arch. f. Augenheilk.*, XXII. 1) reports having recently examined thirty eyes enucleated to avoid sympathetic disturbance, and in not a single instance did he find micro-organisms.

As to the experiments on rabbits, guinea-pigs, and dogs, the weight of evidence goes to show that not only is there no analogy between the disease as seen in man and in these animals, but also that sympathetic ophthalmitis cannot be produced in these animals through the agency of the staphylococcus, and that, consequently, such experiments can throw no positive light upon the subject.

Randolph, as in his former papers, is unable to comprehend how Deutschmann discovered in every case such uniform conditions of neuritis extending along both optic nerves and the chiasma. In the light of all the experiments that have subsequently been made, and with nothing but negative results, it seems unreasonable to look upon the infection theory, as demonstrated in the experiments of Deutschmann, as in any sense established.

**Archives of Ophthal.*, Vol. XVII. p. 187, and OPH. REV., 1889, p. 166.

The reasonableness of the infectious origin of sympathetic ophthalmitis no doubt aids its general acceptance, but almost the entire support of the theory, according to Randolph, consists of the results of a few experiments in rabbits with the pus-organism. Suppurative panophthalmitis in man, in which the pus-organisms are most abundant, does not, as a rule, give rise to sympathetic disease.

Randolph does not wish to be regarded as entirely opposed to the infection theory of this disease, but only so far as the pus-organism is concerned. There are, he remarks, many organisms, about which our knowledge is very limited, and it is possible that sympathetic ophthalmitis may have its own specific germ, which, he suggests, may not be bacteric, but belong to some other class of micro-organisms.

J. B. L.

J. Mitvalsky (Prague). On the Pathology of Circumbulbar Dermoid Cysts. *Archives of Ophth., XXI.* 3.

Reference is made in this paper to fourteen cases of dermoid cysts of the orbit, and more especially to one which presented so many peculiarities that the author has thought it worth while to describe it in minute detail. He divides orbital cysts into two main divisions, viz.: (1) those situated in the orbit, which, when they attain any considerable size, displace the globe; and (2) dermoid cysts of the margin of the orbit. This last division may again be subdivided into (*a*) those within the orbital margin, dermoid cysts of the lids, and (*b*) those for the most part outside the orbital margin, usually situated upward and outward—cysts of the region of the brow—but occasionally also lying below the orbit.

From a series of 51 cases Berlin found 53 per cent. of these cysts placed on the nasal side of the eyeball. In

Mitvalsky's cases, on the other hand, the cysts were on the temporal side—a position which Berlin has ascribed to 24 per cent.

We report, in abstract, the description of Case I. and also that of Case XIV.—the peculiar cyst above referred to. The description of the others, which for the most part do not differ from the usual, may be omitted.

Case I.—A. S., æt. six months, had a dermoid cyst the size of a pea in the right upper eyelid, above the outer commissure. When removed and examined microscopically the contents were found to be white, friable, and almost dry, and showing hairs. Microscopically it consisted of numerous flattened layers of horny epidermic cells, among which were some round fat globules and a few minute hairs. The cyst-wall showed the ordinary structure of the external skin, modified however in some respects, more especially as regards the thickness of the layers of particular points and the variable size of the cells. Everywhere there is a thick corium lined internally with an epidermic layer. The corium presents the usual structure of fibrillar connective tissue with flattened connective-tissue cells and spindle-shaped nuclei. The nuclei are fusiform in the superficial layers, but shorter and thicker in the deeper ones. In those parts of the cyst-wall where there are hair follicles, acini of sebaceous glands and sweat-glands, the corium is easily divisible into a closely-formed inner layer and a coarser outer layer, in which are follicles and glands. The inner surface of the corium is smooth almost throughout; there are no papillæ. Hair-follicles are scattered over the whole surface of the cyst, but some have no hairs. The hairs, hair-follicles, and glands are flattened, and run parallel to the cyst-wall.

Case XIV.—A woman, æt. 33, came in September, 1868, with a history briefly as follows: From early childhood her left eye had been slightly prominent. Her parents had thought this was the result of a blow. She had always seen well with this eye until two months before she first attended the clinic, but about that time a dull pain to the outer side of the globe began and gradually increased, the sight at the same time getting worse and the ball becoming more protruded.

In examination it was found that the left eye, while abnormally prominent, was also displaced downwards and inwards. The palpebral fissure was narrowed and the lids could not be closed. The movement of the eye was limited, especially up and in. T − 1½. The conjunctiva was in a state of chronic catarrhal inflammation. Opthalmoscopic examination showed papillo-retinitis with hæmorrhages. Vision = $\frac{1}{10}$. The lacrymal gland was dislocated forward by the tumour, which had a smooth surface, and was of a cartilaginous consistency. An absolute differential diagnosis, the author adds, between a dermoid and an echinococcus cyst was not possible.

It was found very difficult to remove the tumour entire without injuring its walls. It was therefore punctured, and a turbid fluid like soapsuds, with several flocculent masses, escaped. The cyst was then easily removed, except at the apex of the orbit, where it was attached to the optic nerve, a portion of which, 1 cm. long, had to be excised before the growth would come away. The ball was replaced, and the wound united with stitches, a drainage tube being first inserted. The wound healed quickly, and the patient left the hospital on the ninth day, the globe at this time being somewhat pushed forward and the upper lid drooping. T=2. Eight months later the eyeball was normal in appearance, but had sunk in the orbit. Movement was much restricted.

No hairs were found in the contents of the cyst. The masses showed cholesterine crystals and flattened horny cells. The average thickness of the cyst-wall was from 3 to 4 mm.; at one spot there was a plate of bone. No hairs were found.

Microscopic Examination.—Traces of an epidermic lining were found only in the posterior inferior quadrant of the cyst-wall. There are two layers of connective tissue in the wall, an internal of dense, close structure and an external more openly formed and with a considerable admixture of fat. Outside the dense internal layer the tissue is infiltrated with round cells often arranged like follicles. Mitvalsky has no doubt that the round cells here form the connective tissue. At one spot the inner surface of the

wall contained in its coarse meshes polynuclear cells ; cells of the same nature projected into the interior of the cyst, but were more or less degenerated. The circumscribed infiltrations surrounding each blood-vessel show no connective tissue framework and resemble a follicle or lymph-gland.

The plate of bone above referred to shows a structure half-way between spongy and compact, and contains some marrow spaces with vessels and supporting tissues. Near the bone are several ossifying foci, some of them having the structure of hyaline cartilage.

In all the varieties of dermoid cyst the wall is composed of a connective-tissue corium and an overlying layer of epidermis, the variation consisting chiefly in the presence or absence of papillæ and muscle and the other elements of the skin. The variety showing hairs and glands the author found to be most common, no less than 85 per cent. of his cases belonging to this class. In only one instance did he find sweat-glands alone, and again only once were all the adnexa of the skin absent. Most of the cysts have an epidermis essentially the same as that of the external skin ; some, however, have a rudimentary epidermis, but with hair-follicles, which produce normal hairs. Both varieties of epidermis are sometimes present in the same cyst.

Papillæ are rarely found to be regularly distributed over the cyst surface. They are present, as a rule, at particular points only where hair-follicles are also found ; they are usually irregularly formed, being somewhat flattened. It is by no means uncommon for dermoid cysts to show no papillæ, but numerous hair-follicles. Where such is the case, the surface of the corium is smooth and there may be small projections, which may be regarded as microscopic fibromata. The hair-follicles differ only in so far as they are formed either of normal epidermis or of that with but one or two layers of cells.

The concluding portion of this paper is devoted to a short reference to the development of these dermoid cysts and to a brief *résumé* of the more important literature of the subject.

N. M. ML.

AMERICAN MEDICAL ASSOCIATION.

SECTION OF OPHTHALMOLOGY.

FORTY-FIFTH ANNUAL MEETING, HELD IN DETROIT, JUNE, 1892.

(*Continued from p.* 281.)

Injuries of the Lens.—Dr. Milliken read a short paper on this subject (*see page* 287).

Dr. S. C. Ayres had seen quite a number of cases of partial opacities of the lens, and always with surprise and interest. We are taught that injury of the capsule is certain to produce opacity. But he had seen a number of cases in which there were limited opacities of the lens ; and in which, in all probability, foreign bodies had penetrated to the vitreous, and had left limited opaque areas in the lens and capsule. Such cases show the healing powers of the capsule, and that very often it will close when wounded.

Dr. Eugene Smith could bear out what had been said about punctured wounds of the lens occasionally clearing up without cataract or destruction of the lens. He instanced two cases. A child ran a needle through the cornea, penetrating the lens. Following this there was opacity about the size of the needle extending clear through the lens. This entirely cleared up, and the child now has normal vision. In the second case a piece of wire, 1-24th of an inch in diameter, thrown across a room, struck a young lady in the eye, penetrating the cornea and lens. The openings healed up, and in the course of one or two weeks the opacity disappeared. Vision is normal.

Dr. Edward Jackson had seen a man, then aged 80, who gave a history of injury in boyhood, and presented a scar involving the cornea and corresponding portion of the iris, and an opacity of the portion of the lens immediately behind it ; the vision had not deteriorated since shortly after the injury. The case was under observation several years; both lenses were then becoming opaque, but the

injured not more rapidly than the uninjured one. In another case, seen recently, where there had been a penetrating wound of cornea, iris, and lens about a year before, there was the history of marked temporary impairment, then almost complete recovery, and within a few weeks again loss of vision. The larger details of the fundus could still be made out through the hazy lens. But a month later the lens was entirely opaque. The most interesting case of the kind he had encountered was one of congenital dislocation of the lens upward, so that the edge of the lens occupied the pupil, and therefore required discission. This case had been under observation for the last year, and the lens had been needled four times, twice rather freely, and now, six weeks after the last needling, there is no general opacity of the lens. Twice the needle has been passed entirely through the lens to the vitreous, and immediately after this the track of the needle was very well marked, but subsequently it cleared up again. At the point at which the needle entered the lens there remained some opacity, and small pieces of lens-substance have been protruded, and in the neighbouring lens-margin there is a distinct notch, indicating considerable loss of lens-substance, although the bulk of the lens still remains clear.

Dr. J. A. Lippincott, of Pittsburgh, reported two cases in which slight injuries to the lens gave rise to very little trouble. A young lady received an injury from a piece of steel, which penetrated the cornea but did not involve the iris. Through a corneal incision the bit of steel was removed with the magnet. The wound did well, but there was a slight opacity of the lens at the centre. This cleared up, so that in three or four weeks vision was normal. In the case of a man injured while caulking a boiler there was found, a few hours later, a small spicule of copper, the thickness of a sewing-needle and two or three millimetres in length, sticking in the lens and not involving the iris. It was removed with forceps through an incision at the periphery of the cornea. The result was a slight opacity in the part of the lens injured, but no interference with vision.

Dr. Milliken wished to emphasise the point as to the

absence of accommodation in clearing up the lens after these injuries. In some cases of extensive opacity where there had been marked clearing-up under the use of a mydriatic, the question is whether the continuance of its use for several weeks or months would not have effected a continuance of the clearing-up of the lens, and if it might not have remained clear.

Thiersch's Skin-grafts for Pterygium.—Dr. F. C. Hotz, of Chicago, said: To insure the permanent success of our operations for pterygium, we must arrange that the conjunctiva, after being released from it, shall not be drawn back over the cornea again. In those of moderate extent this may be accomplished by drawing together the conjunctiva from above and below, leaving a horizontal linear wound. But if the pterygium be broad there is apt to be left a gap which fills with cicatricial tissue, and a return of the trouble is the ultimate result. In looking for a suitable material to substitute for the conjunctiva in these cases he had thought of Thiersch's skin-grafts, which, in symblepharon, had proved excellent material for patchwork of the conjunctiva. He had tried this plan in three cases. The pterygium was thoroughly dissected back from the conjunctiva, cornea, and sclero-corneal region, and allowed to retract towards the caruncle as much as it would. A graft was shaved from the forearm, directly transported on the razor, and placed upon the large wound-area resulting from the dissection and retraction. It was found best to cut the graft a little smaller than the wound, especially in the horizontal direction. The graft was carefully and smoothly spread out over the wound, with its one edge following the margin of the cornea. It adhered quite readily, and after two weeks its whitish colour blended well with the white of the eye. The experiment was successful in all three cases; the grafted piece adhered firmly to the sclera along its corneal border, and formed a strong barrier that effectually prevented the conjunctiva from again crossing it. He, therefore, thought this plan might be recommended for the troublesome cases of extensive pterygia.

Dr. H. D. Noyes had formerly regarded early pterygium

as of no importance, but had changed his view. Experience has shown that, even before it has advanced on the cornea, it interferes with its curvature, causing corneal astigmatism, and the removal of the pterygium materially alters this.

Conical Cornea.—Dr. R. D. Gibson, of Youngstown, read a paper upon this condition, pointing out that it could not be due to increased tension, which would tend to flatten the cornea by obliteration of the sclero-corneal sulcus. It was generally preceded by poor health, and occurred with lowered intraocular tension. Examined closely, the diseased membrane showed the appearance of fine interlacing lines. He reported a series of cases in which great improvement of vision had been obtained by the use of the galvano-cautery and iridectomy.

Dr. H. D. Noyes considered the morbid phenomenon essentially an atrophy of a part of the cornea, protrusion taking place under normal tension aggravated by pressure of the lids. In the earlier stages such cases are capable of great amelioration by peculiar glasses—often very strong convex or mixed cylinders. To test for the glasses atropia should be avoided, while the stenopaic slit, Thomson's ametrometer, and the ophthalmometer were most useful. But he had seen glasses, selected with great care by the surgeon, absolutely rejected by the patient, and something very different worn with satisfaction. The hyperbolic lenses of Raehlmann did not answer. Rupture of conical cornea is one of the rarest accidents. He had seen a conical cornea three-fourths of an inch long. He had once resorted to excision of a portion of the cornea, putting in sutures, which were removed in three days. An earlier removal would probably have prevented a fistula which occurred. The case recovered, with good vision.

Dr. H. Knapp, after the use of the galvano-cautery, in one case encountered repeated breaking-down of the cicatrix for six weeks. Then the opening closed permanently, but two months later the sight was still poor. In six or eight months, however, the cornea flattened, and there was satisfactory vision. In the next case he made a smaller opening in the cornea, so that only a drop of aqueous escaped. The wound closed soon, and did not re-open, but it was followed by a

peculiar iritis and opacity of the lens, which had to be removed. Ultimately the curvature of the cornea became normal, and the boy is able, after three years, to use his eyes without trouble. For the next case he had a special oval electrode made, to avoid the need of prolonged contact, for he feared the opacity of the lens was due to heat. There was nothing else to cause it. With this the current was turned on and the cornea cauterised to the desired depth—not pierced. The opening closed in five or six weeks. In a fourth case there was perforation and prolapse of the iris, and iridectomy may be necessary. In two other cases operated on in the same way the result was quite satisfactory. But in some of these cases relapse occurred, and the operation was repeated, and the patients can now read fine type at ten inches. From his experience he regarded the galvano-cautery as the best treatment, without perforation, repeating the operation if necessary. It certainly is not essential that any of the aqueous should escape—the result is due to the production of a scar.

Dr. Edward Jackson pointed out that the effect of any tension in the globe, normal or subnormal, would be to cause flattening of the cornea if the resistance were uniform, and that the essential factor was the impaired resistance of some particular part of the cornea, which gave way before whatever tension of the globe was present, causing the conicity. The tension was apt to be diminished. With reference to the correction with glasses, the important fact is that the refraction varies from point to point of the cornea—only a small area will be corrected by any one glass. The glass must be given that will correct the most regular part of the cornea situated before the pupil when contracted as it is for near vision or in a bright light. Eserine and pilocarpine have been suggested to reduce the pupil to the condition it will be in for near work. He had found it better to make the trials with lenses in a very bright light. Retinoscopy is valuable in enabling one to select the best part of the cornea exposed with a contracted pupil, and in indicating approximately the correcting lens.

Closure of the Puncta to prevent Infection of the Wounded Eyeball.—Dr. G. A. Aschman, of Wheeling,

pointed out that chronic dacryo-cystitis was a constant menace to the eye, a recognised contra-indication to cataract and other operations: also that it is present in 20 to 32 per cent. of cases of hypopyon keratitis. It will often be tolerated for years, until removal of the corneal epithelium gives opportunity for infection, and the source of the ulcer is often overlooked until the hypopyon keratitis has developed. It has been recommended to slit the canaliculus and treat the lacrymal disease; but this requires time, and meanwhile the eye may be lost, as it is in 10 to 20 per cent. of these cases. During the past year he tried the exclusion of infection from the sac by closure of the puncta. This was done by passing a fine electro-cautery wire one-eighth of an inch into the canaliculus and burning the mucous lining with a red heat, which resulted in a firm adhesion of the walls. In three cases in which this was tried the result was excellent. In two of hypopyon keratitis improvement occurred only after this was resorted to, and in the third hypopyon was prevented. The puncta were readily reopened afterwards, and the patient, advised to undergo the usual treatment for the dacryo-cystitis that was present in each of these cases.

Embolism of the Central Retinal Artery.—Dr. G. E. de Schweinitz, of Philadelphia, described three cases of embolism of the central artery of the retina, in one of which he had the opportunity of studying the fundus twenty minutes after the lodgment of the embolus. Under these circumstances, the fog-like œdema of the retina was observed to begin simultaneously in a peripapillar haze, and a smaller, somewhat more dense infiltration covering the macular region, the two areas being separated by a portion of comparatively unaffected retina. Gradually they approached each other, and the infiltration became general. In the lower temporal vein there was a moderately rapid circulation of blood, which flowed towards the disc. Vigorous massage of the eyeball produced no effect upon the embolus and no material change in the ophthalmoscopic appearances. There was a primary complete dwindling of the entire arterial tree, followed, seventeen hours after the lodgment of the embolus, by an increase in the size of the arteries, with the single exception of the inferior temporal

artery, which remained thread-like. During this period there was faint return of light-perception, which had previously been entirely abolished. This state of affairs continued for twelve days, when the vessels again shrank to mere threads and vision was completely lost. In the other two cases—one studied five months after the accident and the other fifteen hours after the obstruction to the circulation—there was preservation of a small portion of the field of vision on the temporal side, in spite of the apparent complete obliteration of the central artery. In one case form-sense was preserved in this area upon the temporal side, and in the other only light-sense. In neither of the cases was there a cilio-retinal vessel.

Dr. Edward Jackson said that, as bearing upon the question of embolism, or thrombosis, he had in mind one case which occurred in a young man apparently healthy. The patient gave a clear history of repeated attacks of temporary impairment of vision in the affected eye. These attacks had occurred for some years, at first at long intervals. The final attack occurred on a Sunday morning while he was reading the newspaper. He said the sensation was similar to that experienced on former occasions. He stopped reading, and sat for a few minutes, but the trouble did not pass off, and, instead, vision rapidly went from perception of large objects to loss of light-perception. Dr. Jackson saw him twenty-two hours after the occurrence of the trouble. Light-perception was then lost. Œdema was very marked. The margins of the disc were obscured and the retinal veins contracted irregularly. There was no movement of the column of blood. The arteries were not materially altered in appearance. The patient remained in good health until the occurrence of an attack of typhoid fever, from which he died.

THE RELATION OF CONVERGENCE TO ACCOMMODATION AND ITS PRACTICAL BEARING.*

By Archibald Stanley Percival, M.A., M.B., B.S., Camb.
Ophthalmic Surgeon to the Children's Hospital, Newcastle-on-Tyne.

Every ophthalmic surgeon occasionally meets with cases of asthenopia, the symptoms of which are not relieved by the correction of the error of refraction alone. These patients have a tendency to drift from one oculist to another, and at each visit some trifling modification is made in their prescription; a quarter of a dioptre is now added, now subtracted from their spheres or cylinders, but still their symptoms continue. Finally, in despair, they abandon the spectacles which they cannot wear with comfort, and seek relief in the last new drug advertised to cure headaches.

Such patients are commonly of the neurotic type. They are easily excited; a slight reverse will depress them to a state of gloomy despondency, as slight a cause will raise them to an almost pathological condition of exhilaration; but their more usual state seems to be that of depression. Does their asthenopia depend on their constitutional condition, or is it due to some local cause? I believe it to depend on both factors—*i.e.* that a local condition which would be quite insufficient to give rise to more than passing discomfort in a patient of more stable equilibrium will cause extreme distress in these subjects.

* Read at the annual meeting of the British Medical Association held at Nottingham, July, 1892.

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In such cases I have been led to pay especial attention to the relationship of convergence to accommodation. We owe to Donders the first accurate account of this relationship, and the subject has been further elucidated by Nagel, Landolt, Maddox, Berry, and others. They have shown us that for each dioptre of accommodation exercised there is a certain range of convergence, and, further, that the amplitude of this relative convergence not only varies with each dioptre of accommodation exercised, but that it admits also of individual peculiarities. This is indeed evident from a study of the charts given by Donders;* but I think that its practical bearing is not always recognised.

To indicate my meaning more clearly, I append a chart of the functions of accommodation and convergence in an active man of twenty-four who came to me for glasses (Fig. 1). I found simple hypermetropia of + 6D; but his binocular manifest hypermetropia was only 3D. When lenses stronger than + 3D were given his eyes diverged. He resembled, in fact, those myopes who, in their efforts to maintain their accommodation relaxed, acquire a divergent squint. With abducting prisms of 2° dev. he was able to wear the full correction. The chart shows what discomfort the full correction would cause him until he could adapt himself to the new conditions, this adaptation involving a new relationship of the functional activities of the nerve centres for accommodation and convergence. Fortunately, most patients are able to adapt themselves to the glasses ordered for them †, even though these embody a full correction, or something very near it. Thus, though I ordered for my patient + 5D, he only

* Refraction and Accommodation of the Eye.

†This power of adaptation is one of the chief difficulties we have to contend with in plotting out these charts of relative ranges; we find them changing even during the examination, so that none of the charts can be regarded as more than approximate representations of the real conditions.

complained of discomfort for the first few days, and then professed himself to be much pleased with the glasses.

Such cases are probably not uncommon. Nagel has

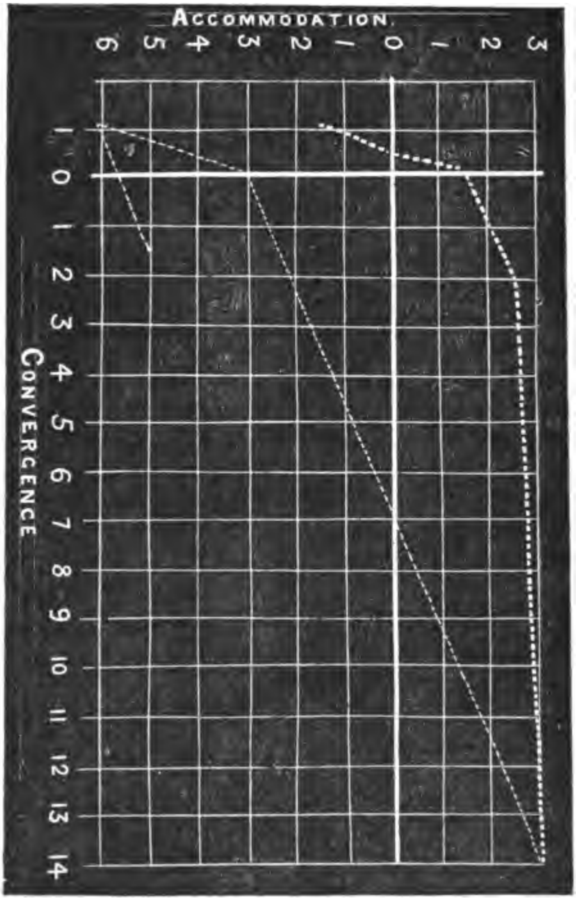

FIG. 1.

The vertical lines represent the angles of convergence—thus, 0 denotes parallelism of the visual lines ; 1, 2, 3, 4. etc., denote the convergence necessary for distances of 1, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$ metre. Similarly, the horizontal lines refer to the function of accommodation—thus, 0 denotes accommodation of the eye for distance ; 1, 2, 3 represent the accommodation necessary for distances of 1, $\frac{1}{2}$, $\frac{1}{3}$ metre. The figures below the horizontal line 0 denote negative accommodation, just as the figures to the left of the vertical line 0 denote

negative convergence or divergence of 1, 2 metre angles. The upper curved dotted line represents the near points of accommodation (P_a); the spaced line the far points (r_a), which correspond to the different amounts of convergence exercised. Obviously, the relative range of convergence is given by the horizontal distance between the two curved lines at the level that corresponds to the accommodation exercised. The lower spaced line shows in part the alteration in the curve of the far points that was found at the second visit.

published a chart which resembles mine very closely *. Less marked conditions of a similar nature are of daily occurrence. The discomfort so frequently noted when glasses are first worn is doubtless due to the new co-ordination of convergence and accommodation necessitated by them, for it ceases when this is established.

On examining the few charts that have been published of the relation of convergence to accommodation in normal hypermetropia and myopia, we see that this relation is developed in accordance with the requirements of the individual. The hypermetrope learns, as a rule, the art of accommodating without converging; the myope that of converging without accommodating. If, now, the conditions are changed by wearing glasses, there is no *prima facie* reason, provided that the patient have sufficient enterprise, why he should not learn to adapt himself to the refractive correction ordered for him, and experience shows that in the majority of cases he does so.

We know, however, that in ametropia the necessary

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* "Traité Complet d'Ophthalmologie," vol. iii. p. 212, where the chart is reproduced by Landolt. It will be noticed that I have chosen a method of numbering the dioptres of accommodation in these charts which differs from that usually adopted. The figures represent the reciprocals of the distances for which the eye is accommodated. Thus 0 corresponds to the condition of the eye accommodating for infinite distance, whatever the refractive condition of the eye. The degree of hypermetropia is indicated by the origin of the spaced line *below* the line 0; in myopia the origin of the spaced line would be *above* the horizontal line 0, as distant vision is impossible. This method renders the comparison of charts of different refractive conditions much more simple and satisfactory. Another new feature is the representation of the amount of possible negative convergence (divergence).

adaptation is often only partially, if at all, developed. The convergent strabismus of the hypermetrope, the spasm of accommodation, and the divergent strabismus of the myope are familar examples. In such cases the hereditary bias towards the normal (emmetropic) relation between the two functions seems greater than can be overcome by the desire for distinct binocular vision.

We see, then, that though in most cases the relation between convergence and accommodation can be altered very considerably to meet the different requirements of the individual, yet in some cases there is a peculiar difficulty that prevents this adaptation. This seems to explain the difference of opinion of ophthalmologists on the subject of faulty muscular tendencies. Some, laying stress on their observation that such faulty tendencies in some cases do not give rise to asthenopia, are inclined to disregard them in all cases, and confine their attention to the exact correction of refractive errors. Others urge the correction of every anomaly as soon as it is discovered, attributing to it almost any ache or pain, or, indeed anything else that the patient may suffer from. The position I take is that, if the relation between the two functions is unfitted for present requirements, and if there is no sufficient faculty of adaptation, we should make the glasses suit the patient, instead of vainly attempting to make the patient suit the glasses.

To refer again to the hypermetrope whose chart (Fig. 1) I have given, he was persevering enough to learn to use the glasses. Had he been unable to alter the relation of convergence to accommodation it would have been necessary to give him either + 6 D sph. $\frown$ 2° dev. prism edge out for each eye, or + 3 D sph. or something between the two. It would, however, have been worse than foolish to order prismospheres for this patient, as he had such good adaptive power. Indeed, after wearing his glasses a fortnight he acquired

a relative range of convergence closely resembling that of the normal emmetrope. I noted, or instance, that he could overcome adducting prisms of 2° 30′ dev. before each eye (1·5ma.) even when exercising only 1 D of accommodation.

Neurotics seem to be usually unable to adapt them-

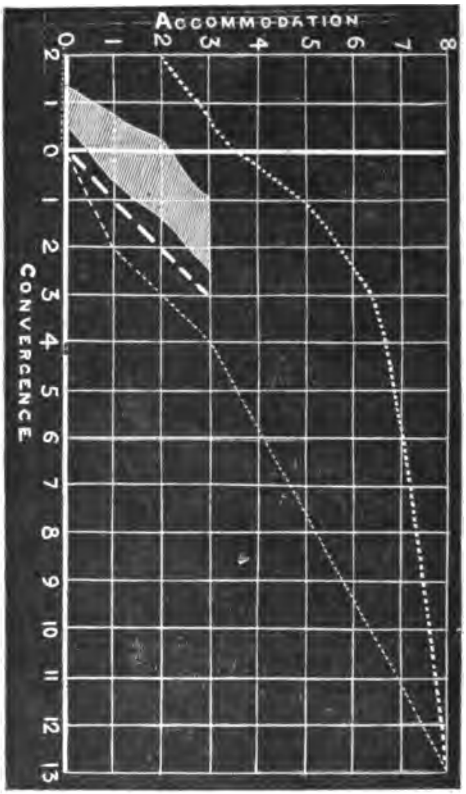

FIG. 2.

In this and the following charts the spaced line drawn diagonally from 0 to 3 represents all the states of complete adaptation of the eyes, both as regards accommodation and convergence, for objects at distances varying from $\frac{1}{3}$ metre to infinity; it represents, in fact, the demands of binocular clear vision for this range of distance. The shaded area represents the suggested limits of the "area of comfort."

selves to new conditions; possibly they cause so much distress that these patients do not try to get accustomed to them. It seems in some cases as if the accurate refractive correction brings on an explosion of neurotic symptoms.

Occasionally one finds an anomaly of the relationship of convergence to accommodation without any refractive error. For example, Mrs. F., a neurotic emmetrope, aged 25, suffered from asthenopia, which seemed to be due to an abnormal relative range of convergence. The chart (Fig. 2) shows that she could just preserve parallelism with relaxed accommodation, and that she could also simultaneously converge 3 ma. and exercise 3 D of accommodation. Perhaps some would take the view that she required no glasses. It will, however, be noticed that with 0 accommodation her relative range of convergence was represented simply by the distance between 2 ma. of divergence and 0. Consequently she had to make a considerable effort in order to maintain parallelism, for she had to exercise the utmost convergence possible for that condition of her accommodation. Again, when using 3 D of accommodation for reading, her relative range of convergence was represented by the distance between + 4 ma. and —·5 ma. It is probable, therefore, that some effort was required to maintain 3 ma. of convergence. Apparently the difficulty had existed all her life. She had always been subject to headache, pain in the eyes, and frequent attacks of conjunctivitis with puffiness of the lids. Glasses + 1 D for reading had already been given, but they naturally aggravated her discomfort, as the chart indicates. She would probably get relief from abducting prisms, or from weak concave glasses, which, by exciting accommodation, would render more convergence available. I chose the former alternative (1° dev.), and they have been completely successful in relieving her of pain, and, what is perhaps better evidence of their benefit, the puffiness of the lids and conjunctivitis have disappeared

and have shown as yet (six months) no tendency to recur.

When, therefore, the correction of the refraction fails to relieve, we may, I think, generally assume that, in the absence of hyperphoria, the patient's difficulties depend

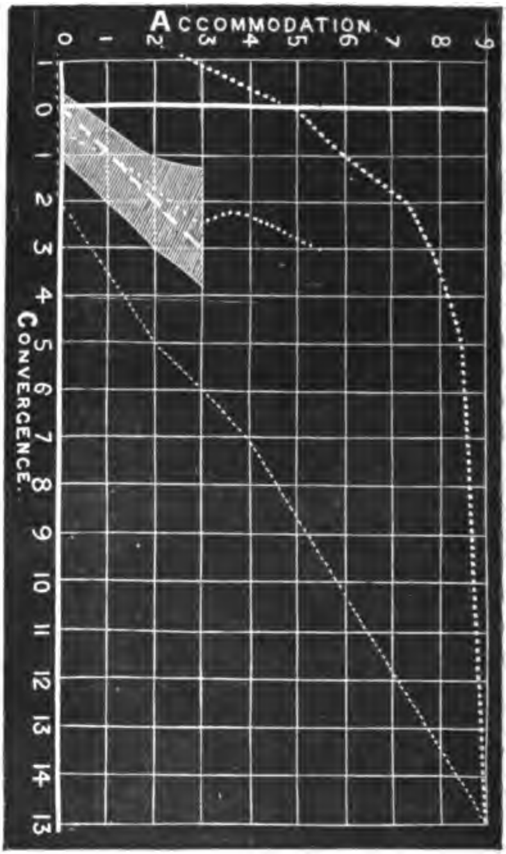

FIG. 3.

on his inability to effect that alteration in the relation of convergence to accommodation which is necessitated by his visual requirements. In such cases it is obvious

that we must make the best use we can of the relative range that the patient has. How are we to find glasses to suit such patients?

By spherical lenses we can call into play or exclude any amount of the accommodation, so that we have practically complete control over the abscissæ of the chart; we can move them upwards or downwards at will. Again, by prisms or operative interference we have a similar control over the ordinates; the zero point can be placed almost where we please, either to the right or the left of its original position. The requirements of most people will be satisfied if they can see clearly and without discomfort both distant objects and those at $\frac{1}{3}$ metre. Clear binocular vision for these distances will be possible if the diagonal from 0 to 3 lie within the figure bounded by the lines representing the relative ranges, and possible only on this condition, but this does not necessarily imply comfort. What, then, determines the *area of comfort?*

Fig. 3 represents the chart of my own ranges when wearing the full correction for my errors of refraction. The dotted line represents the amount of convergence which is naturally associated with each dioptre of accommodation exercised. With 0 accommodation I tend to converge slightly (·5 ma.), with 3D accommodation I tend to converge less than 2·5 ma., and the same with 4D accommodation. Maddox and Bolton* examined twelve emmetropes with regard to the position of repose† with accommodation relaxed and with 4D exerted. The average positions as found by them agree very

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* *Journal of Anatomy and Physiology.* Vois. XX. and XXI.

† The positions of repose were found by Maddox' glass-rod and the cover test. My own chart is somewhat remarkable from the excessive amplitude of accommodation for my age (30) and the amplitude of my relative ranges. This may be partly due to the repeated tests to which I have submitted myself and to my experiments in reading with prisms and glasses of various kinds to determine the conditions that would cause asthenopia in myself.

closely with those found for myself. Now muscular asthenopia was absent in all these cases, so that the area of comfort is at least as large as the space between the repose (dotted) line and the diagonal. In all probability it is a good deal larger. This diagram, coupled with Maddox' observations, shows that the glass-rod test alone is not an absolute indication of the strength of the prism to be prescribed. It will be observed that the repose-line almost bisects the space that represents the relative ranges from 0 to 3; above this, however, it ascends almost vertically.

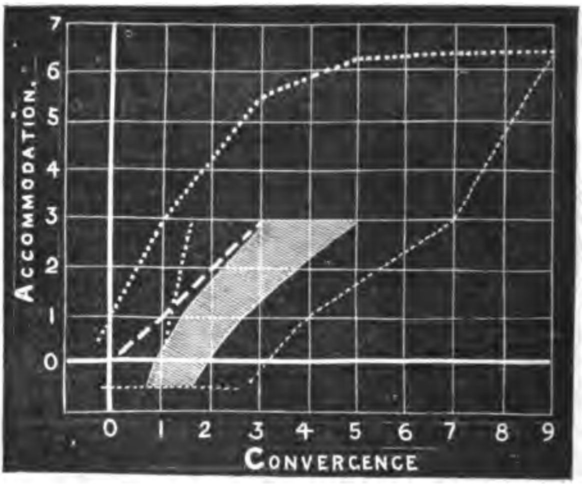

FIG. 4.

I think we may assume tentatively as a working hypothesis that the *area of comfort* occupies about the *middle third* of the relative range of convergence between the limits corresponding to an exertion of 0D and 3D of accommodation. I have defined the limits in this way from a careful examination of my notes and charts, assuming that when a prism gives relief it brings the diagonal within the area of comfort.

Above 3D this definition obviously does not hold

good; but we need not trouble ourselves about the discomfort of a patient who persists in holding books too near his eyes when provided with proper glasses.

Of course, the area of comfort may be of different dimensions in different individuals, but further investigations are required to determine this point.

On referring to Fig. 2 it will be observed that the prisms (1° dev.) which gave relief just brought the diagonal within the (shaded) area of comfort. Two more cases, whose charts I show, will also illustrate my point.

Fig 4 is the chart of a man, aged 29, the significance of whose symptoms I at first missed. His eyes tired easily and were liable to become blood-shot. I found

R. + ·25 D ⌒ + ·5 D cyl. ax \75 $V=\frac{6}{6}$
L. + ·5 D ⌒ + ·5 D cyl. ax \80 $V=\frac{6}{6}$

amplitude of accommodation 7D. He read much, using glasses + 1D, but was liable to discomfort at other times. I thought that, with so small a refractive error and such good accommodation, he ought not to need glasses, but I found he was worse without his glasses, and that even correction of the astigmatism failed to give relief. A further investigation showed that his convergence range was contracted both at the positive and the negative extremities. The absolute range was only 9·25 ma. It will be seen that the diagonal 0 to 3 only touches the area of comfort at one point, and, further, that the 1D glasses which he had found serviceable for reading (since they relaxed his accommodation) corresponded to a point in the centre of that area, so that their beneficial influence is explained. The esophoria for distance, however, was uncorrected, and to this I attribute the continuance of his symptoms.* I recommended orthoptic exercises to increase the con-

* Another point of interest in this case was the "line of repose." When tested with objects at distances from ⅓ metre onwards, it was found that his eyes tended to converge in such a way that the "line of repose"

vergence range, but as my patient declined to undertake them, I gave him prisms of 1°, combined with correction of the refraction, and he has written to say that the result is completely satisfactory.

The next chart (Fig. 5) is that of an exceedingly perplexing case.

The patient was of pronounced neurotic type; she had been subject to headache all her life, true migraine

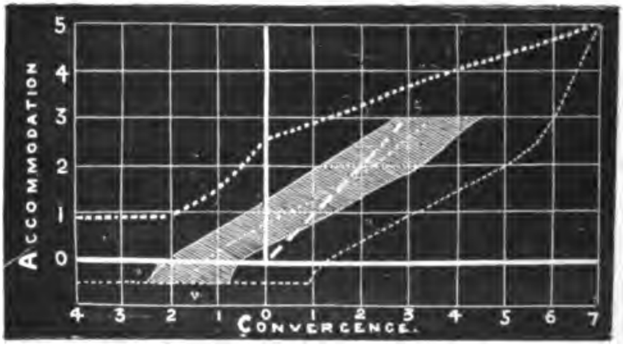

FIG. 5.

and occasional attacks of giddiness. These attacks seem to have come on when she looked attentively at distant objects quite as much as when she attempted to do needlework.

Under homatropine I found

R. + ·25 D $\bigcirc$ + ·5 D cyl. ax ╲ 40 V = $\frac{6}{6}$, $\frac{6}{5}$ ir

L. + ·5 D $\bigcirc$ + ·5 D cyl. ax ╱ 10 V = $\frac{6}{6}$, $\frac{6}{5}$ ir

She had visited many distinguished specialists, who had

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almost exactly bisected the area of comfort (the shaded part). When, however, the test-object was placed at 6 metres distance and his accommodation excited by concave glasses, it was represented by the dotted line. The position of the repose line is affected both by the functional association of the convergence and accommodation centres and by the mental idea of distance, as I think Maddox has pointed out. It is interesting to note the very great influence that the estimation of distance has on this test in this subject, though I find that in my own case its effect is barely appreciable. The obvious inference is that the former method of applying the test is to be preferred for practical purposes.

all found practically the same error of refraction. She had 5 D of accommodation corresponding to her age—39. She had no hyperphoria, but very curious convergence relations. The absolute near point was at 14 cm. while the far point was indicated by her power of overcoming abducting prisms of 7° dev. before each eye. The absolute range then extended from 4 ma. of divergence to 7 ma. of convergence. The chart has the form that is commonly seen in myopia: it seems she had acquired considerable power of converging without accommodating, but to an extent inadequate for her peculiar condition, though sufficient to prevent divergent strabismus. Maddox' glass-rod test showed divergence 5°, *i.e.*, 2° 30′ each eye for distance, but not for reading. Indeed, the exclusion method revealed some tendency to excessive convergence when the test object was held at $\frac{1}{3}$ metre distance. One could reasonably have given her -1 D spheres, combined with cylinders for distance, to enable her to overcome the latent divergence with more ease, but this had apparently already been tried without success. She seemed to have some difficulty in maintaining her accommodation, though its total range was normal for her age. I ordered abducting prisms of 1° 30′ with + 1 D added to the cylinders for reading, but I felt far from confident of their success. One would not have been justified in dividing her external rectus, as, though that might establish a good relative convergence range for distance, it would most probably produce an extreme degree of accommodative asthenopia for reading; in fact, her condition would resemble that of a presbyope who cannot accommodate sufficiently without excessive convergence. She has written to me to say that for eight or nine months after obtaining these glasses she was almost entirely free from her old headaches, and that she was able to continue reading and working without fatigue, but that she then got influenza, and has since been troubled with her old pains, though not so severely as formerly.

In conclusion, I would repeat my plea for prismatic combinations. The disrepute into which they have fallen should, I think, be rather incurred by the methods of their employment. Opinions still differ as to the ideal condition at which we should aim, as well as the manner of attaining it. Most authorities have taken the absolute range of convergence as the basis on which to work. Landolt, to whom we are so much indebted, has made the suggestion that only one-third of the absolute range can be exercised continuously without fatigue. Now it seems to me that what I have termed the area of comfort must be determined from the relative range. That part of the absolute range which is beyond the relative, for a given amount of accommodation, cannot by any effort be brought into action, and must therefore be excluded. I have failed more than once when adopting Landolt's principle. One patient whom I had treated in this way returned, and I was successful in my second prescription, in which I corrected nearly all his esophoria for distance —in fact, unconsciously I probably gave the same prescription that my present method would determine.

Some have aimed at putting the absolute far point of convergence (r_c) in its normal position, others at altering the position of the near point (p_c) to that which normally obtains. I think chart 5 is conclusive evidence against adopting the first principle, and chart 4 is equally decisive against the second.

The position of repose for *distance*, as given by the glass-rod or some similar test, is often relied on as a practical guide to the correction necessary. Fig. 5 shows that such a procedure would fail in this case, though no doubt it frequently gives satisfactory results. In case 2 it will be seen that almost exactly the same indication would be given whether we adopted the principle of displacing the far point (r_c) or of correcting the latent divergence (glass-rod test), or that which I am now advocating, and which seems to me to be a general principle applicable to all cases. I may say that I have

not had a failure since adopting it; in two cases there was no error of refraction, in two others the refractive errors had been previously accurately corrected without relief.* In looking over the notes of my other cases, I find that they were either complicated with hyperphoria or with previously uncorrected errors of refraction, so that the evidence they afford for the truth of my proposition is inconclusive.

I am conscious of the pitfalls that lie in the path of the hasty generalizer from insufficient data, and I would therefore ask for the benefit of the experience of others. My present views may be expressed as follows :—

1. The correction of refractive errors, if of high degree, causes a profound alteration in the relative activities of the nervous centres for convergence and accommodation. Most individuals have a remarkable power of adapting themselves to the new conditions caused by such correction, and for them prismatic combinations are unnecessary.

2. For those individuals who cannot so adapt themselves to the correction, relief will often be given even by weak prisms that diminish the strain.

3. That the relative, not the absolute convergence is the basis on which to found a principle of treatment.

4. That the "area of comfort" is roughly represented by the middle third of the relative convergence range, and that practically we need only concern ourselves with that which has to do with the vision of objects at and beyond the distance of $\frac{1}{3}$ metre.

5. That the glass-rod test is to be regarded as a rough qualitative test, but it is not a reliable indication

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*I think with regard to *accommodative asthenopia*, it will be found that the proportion that can be exercised without fatigue is really a function of the relative, and not of the absolute, range of accommodation. I have, however, found Landolt's principle ($\frac{2}{3}$ of total accommodation) practically so useful and so generally applicable that I have no wish to suggest an unnecessary complication.

of the strength of prism that is required to give relief in these cases.

If complete charts were plotted out in all cases of muscular asthenopia they would throw much light on this difficult subject, but the time and patience demanded in working them out with neurotic subjects debar their general adoption. I think the following tests will in most cases be sufficient, and even these points, if accurately determined, will probably tax the patience of both examiner and examinee :—

1. Correct all errors of refraction, and determine the relative range of convergence for 0 accommodation by means of abducting and adducting prisms, the test-object being at a distance of at least 6 metres. The revolving prism of Lucas Crétes is exceedingly convenient for this purpose.

2. Repeat the test with the test-object at $\frac{1}{3}$ metre. This will give the dimensions of the range on either side of the point corresponding to 3D of accommodation and 3 ma. of convergence.

3. Find the absolute maximum of convergence in order to determine if the range is much contracted. An accurate determination of the near point of convergence (Pc) is, fortunately, usually unnecessary.

In all cases when prisms and lenses are used together the effect of the combination should be calculated or determined from the tables already published. (OPHTH. REV., vol. x. p. 299.)

Carl Hess (Leipsig). The Pathological Anatomy of Congenital Malformations of the Eye. *V. Graefe's Archiv. XXXVIII.* 3.

Continuing his researches on this subject, the earlier results of which he has already published in previous numbers of the *Archives**, the author presents us with a fresh series of cases, some of them of exceptional interest.

Case I.—The eyes were those of a child which died a few days after birth. As well as malformation of the eyes, there was an extensive double harelip with cleft palate. The brain showed no noteworthy alteration from the normal. The condition was practically the same in each eye, so that a description of one will suffice for both.

The globes were very small, measuring antero-posteriorly 10 mm. and transversely 9 mm. The diameter of the lens was nearly 4 mm., *i.e.*, almost half the diameter of the entire globe. The corneal measurements were 4 mm. in the horizontal and 3 mm. in the vertical diameter. At the lower part of each iris there was a small coloboma. The cornea, sclerotic, and choroid were normal. The latter showed little pigment and was without any trace of coloboma. The retina was almost everywhere detached, whether artificially or owing to defective development of the vitreous the author does not venture to say. Its histological structure is for the most part perfectly normal. In the small space enclosed by the separated retina there was no indication of vitreous tissue.

From the optic papilla forwards to the posterior pole of the lens stretches a delicate process of connective tissue enclosing the hyaloid artery; having reached the posterior pole, which, by the way, lies almost exactly at the middle point of the globe, this thread of tissue broadens out in a somewhat curious manner: thus upwards and towards the sides it spreads over the lenticular surface for only a short distance, but it becomes much more developed below

* For abstracts of the former papers see Oph. Rev., Feb. 1889, p. 45, and July, 1890, p. 211.

as it approaches the lower edge of the lens, and is thence continued forwards towards the ciliary body, finally to become so intimately blended with the ciliary muscle that it is impossible to say where the one ends and the other begins.

The persistence of this delicate sheath and the backward displacement of the lens apparently due to it have led to some peculiarities in the formation of retina and ciliary body which are worthy of notice. In the upper half of the globe the retina and lens capsule are in close relation. With the withdrawal backwards of the lens the retina has in parts also been dragged upon, and, as bearing this out, there was found on the upper parts of the capsule a tolerably regular layer of cubical, and in places pigmented, cells corresponding to the *pars ciliaris retinæ*. More towards the vitreous the retina is normal, and it was noted in many sections that the point at which the healthy retina passed into the *pars ciliaris retinæ* corresponded closely with the situation of the posterior pole of the lens. The ciliary body has also been pulled back, more especially at that part where the connective tissue layer above referred to enters it from the lower lenticular edge, and a well-formed layer of pigment cells can be followed along this band of tissue from the ciliary body nearly to the lens. The author draws special attention to the fact that there is nowhere the slightest trace of past or present inflammation. The lens is completely cataractous.

This case bears a very close resemblance to one described by Hess in an earlier paper on the subject, to which he briefly refers. Here also there was a small coloboma of the iris, and a well-marked persistent hyaloid artery in close relation with a thread-like band of tissue, which was continued forwards from the lower margin of the lens directly through the coloboma. In this case, too, Hess feels certain that the changes were in no way due to inflammation. Of special histological interest, in the author's opinion, is the formation of the band between the lens and the ciliary muscle in the first of the present series of cases, and this, particularly when taken in conjunction with the nearly similar condition

in the case which he quotes, tends to strengthen his view that the cause of the iris coloboma may be looked for in a mal-development of the fœtal lens-capsule.

Case II.—The globe (a pig's eye) is of normal size. Anterior to, and below, the optic nerve entrance there is a nearly circular protrusion of the sclerotic, whose diameter is 12 mm., and whose greatest depth, measured from the level of the surrounding tissues, is 8 mm. The sclerotic included in this part is very thin, and of a bluish colour. In opening the eye, the cup—as seen from the inside—is found to be filled with a substance resembling the vitreous humour. The choroidal and retinal pigments reach to its edge, but do not enter it.

Microscopic Examination.—The sclera is normal up to the margin of the ectasia; at this point it becomes thickened towards the interior of the globe, and gives rise to a ring-like swelling, which completely surrounds the cup. The pigment-cells, which in the sclerotic of the pig are tolerably abundant, are in the protruded portion only sparsely scattered about.

The choroid is quite healthy up to the scleral marginal thickening. In the immediate neighbourhood of the affected area the cross-sections of the choroidal blood-vessels become smaller and more widely separated than elsewhere. The choroid also at this point is thinner and more intimately connected with the sclerotic, and stops abruptly short at the edge: there is no trace of the membrane in the cup itself.

The pigment epithelium of the retina reaches to the scleral swelling; on that side of the thickened ring which is towards the protrusion, and closely blended with the sclerotic, is a narrow band of unpigmented retinal epithelium. There are numerous large globular-like spaces on this band, apparently analogous to the so-called choroidal glands (Drusen), mostly round or oval, and filled with a material which generally looks homogeneous, but can occasionally be made out to be delicately fibrillar. Here and there are a few branched cells with large nuclei and a very small amount of protoplasmic contents. These small bodies are in this situation so numerous that they frequently abut on

each other, being separated only by a very delicate film of tissue: in other parts, where they are not quite so abundant, the intervening tissue is seen to be covered with hexagonal retinal cells, unpigmented, but directly continuous with the normal pigment-cells of the retina beyond the margin of the cup. As a result of this glandular degeneration the retina is here much thinner than it should be, and in parts hardly recognisable. In the interior of the cup itself it is not possible to detect any epithelial layer.

The other retinal layers, normal up to the edge of the depression, gradually disappear as they enter its depths: thus the nuclear layers, that of the ganglion cells and the layer of rods and cones, are all absent a short distance within its margin, and the only remains of retina are seen in a thin fibrous membrane, closely adherent to the sclerotic and entirely devoid of nervous elements. From the bottom of the cup, apparently springing from the degenerated retina, are two thin processes of connective tissue, which are prolonged towards the centre of the eye, and, becoming more and more filmly as they proceed, are finally lost in the substance of the vitreous. There is no coloboma of the vitreous.

The author has observed a very similar condition in one other case, and considers it most probably due to an incomplete closure of the secondary optic vesicle.

Case III.—This is also the eye of a pig, in which, as in Case II., there was in the neighbourhood of the posterior pole, and under the optic-nerve entrance, a small circular ectasia about 1 cm. in diameter. In the process of hardening this protruded portion has become inverted towards the vitreous.

Macroscopic Examination.—The eye is of normal size. In the region of the protrusion the sclerotic is much thinned, and transparent. As in Case II., there is no appearance of choroidal or retinal pigment in the cup.

There is a well-marked coloboma of the vitreous, 5 mm. long and 1 mm. broad, stretching inwards from the deepest point of the cup. The vitreous itself is perfectly clear, and lies in natural relation to the retina.

Microscopic Examination.—At the margin of the ectasia

the sclerotic gradually shades off into its thin portion without the intervention of any thickened ring.

Just before reaching the edge of the cup, the choroid, elsewhere normal, increases in thickness, at the same time becoming less pigmented. In the depression itself there are only a few pigmented cells, which might belong either to the choroid or the sclerotic; choroidal vessels are here entirely absent.

The retina is for the most part normal. Choroid and retina are less intimately connected than in the preceding case. The pigment epithelium shows no change until it reaches the rim of the ectasia: at this point it loses its pigment, and shows one or two areas of "cystic" degeneration (Drusen), which are, however, much less marked than in Case II. The epithelial layer can be followed for a short distance into the depression, but is lost lower down. The nuclear and ganglion-cell layers have almost disappeared. In the greater part of the depression the retina can be recognised only as a thin fibrillar membrane not separated into layers: here and there, however, traces of the combined nuclear layers are discernible, forming one highly pigmented sheet.

From the middle of the ectasia there springs a small connective-tissue process, 2 to 3 mm. wide, which penetrates the vitreous. In many sections this is seen to be composed of two separate layers, and it is possible to trace the passage of one of these layers into the substance of the surrounding retina. There can be no doubt, the author thinks, that this process is really a reduplication of the retina, which has been formed from the inner wall of the secondary optic vesicle.

The coloboma of the vitreous previously referred to stretches radially inwards, and ends, as seen in section, in two blunt processes, which are apparently cul-de-sacs. It is bordered by a very delicate sheath, which appears to be continuous with the lining membrane of the vitreous.

These two cases are closely analogous to one described in the author's second paper, to which we need not here further refer. The presence of vitreous coloboma is of unusual interest; this condition is very rare—indeed, has only been histologically described in two instances: the

present one, and Number IV. in the first series of cases reported by Hess.

As to the nature of the colloid degeneration the author declines to commit himself beyond saying that he believes it to be due to an alteration of the retinal pigment epithelium, and not to any change in the choroid.

Case IV.—The eye is that of an anencephalous newborn child. Owing to unsuccessful preparation of the specimen the description of this case is of the briefest, and does not include any accurate record of its histological structure. We think it better, therefore, to pass it over without further reference.

Case V. is of particular interest, seeing that no other like it has as yet been described. It is that of an embryo chick taken from an incubator on the fifth day (120 hours), in which the left eye only has developed. The length of the whole embryo is about 10 mm., the brain for this age being unusually large. The two halves of the brain are, to macroscopic observation, apparently similar throughout. There is a slight difference between the nasal and upper-jaw processes of the two sides, the left being longer and rather narrower than the right. The left eye appears to be normally developed; its diameter is about 1·5 mm. The ocular cleft is open in its whole length. At the point where the right eye should be is a shallow oval depression, which is bounded in front and above by the nasal, and in front and below by the upper-jaw process; backwards this little hollow gradually shades off into the neighbouring surface.

Microscopic examination confirms the impression that the left eye is perfectly normal, and for the age of the embryo fully developed.

There is absolutely no trace of the right eye either in its epiblastic or mesoblastic elements. The author draws special attention to the entire absence of the lens. In every other respect the embryo is well formed.

Of the recorded cases of anophthalmos, both double and single, by far the largest proportion have been observed only clinically. In a few instances a partial microscopic examination has been made, but the results have not been sufficient to give satisfactory information on the

subject. The present case is therefore of more than usual importance, as it throws a light on the true nature of anophthalmos, a question which has aroused a considerable amount of controversy. The view perhaps most generally adopted is that the eye has at an early stage of its development been by some means destroyed, and consequently ceases to grow; but others maintain that the condition depends on the entire absence of the organ from the very first, while a third theory has it that anophthalmos is really only the highest degree of microphthalmos. It is, Hess thinks, extremely unlikely that, had the eye begun to develop, any process of destruction could at so early a date as the fifth day have removed all traces of its structure; equally improbable is it that development would begin subsequent to this date: so that such evidence as this case affords goes to strengthen the second of the theories mentioned above. It should be remembered, however, that it is, after all, only one case, and must not be taken for more than it is worth; its real interest lies in the fact that it establishes the possibility of complete non-development of the eye; at the same time the author is far from believing that most cases of so-called anophthalmos are of this nature. He feels sure that they represent, as a rule, only a high degree of microphthalmos.

This series of cases includes congenital malformations of the eye of very different types. Considering that in not one of them is there the faintest indication of a previous or present inflammation, while in some the possibility of its having occurred is definitely excluded, the author urges that the tendency to ascribe to inflammation a prominent part in the causation of these malformations should be once and for all abandoned.

Case VI.—The paper is concluded with a description of a congenital abnormality which, though hardly analogous to the others, is yet of great interest. It is that of a cyclops (pig), whose eye and brain Hess has had an opportunity of examining.

The single eye lies immediately over the prominent snout and underneath a short proboscis, about 3½ cm. long., which springs from a bossy elevation of the frontal bone. The eye is nearly spherical, with a diameter of 22 mm.;

the lids do not show the least sign of an attempted division into halves; the lacrymal puncta are absent. The cornea is 17 mm. broad, and oval in shape. In the middle of the upper and lower margins, but more marked above, there is a delicate linear groove; these are united by a very fine vertical line, so that the cornea, unlike the lids, shows a disposition to separate into two.

The condition of the opened globe is shortly as follows: there is only a single optic nerve, which on section was found to be healthy. The retina, detached and much folded on itself, is, at the posterior part, undivided, while in front the relations are more complicated, owing to the presence of two distinct lenses. These are about 4 mm. apart from each other, and seem normal in structure. A ciliary body and well-formed iris are seen to be lying on the outer side of each. Between the two lenses there is a delicate T-shaped membrane which takes origin from the posterior surface of the cornea in the line of its vertical division, and spreads out laterally to form the inner part of each iris, and so to complete the formation of two pupils. The membrane itself consists in part of vascular tissue and in part of fine muscular fibres; its posterior surface is covered with a thick pigment layer and the regular epithelium of the *pars ciliaris retinæ*.

The anatomical relations of the brain of this animal are interesting. Cerebellum and corpora quadrigemina are normal. In place of the cerebral hemispheres there is only an undivided mass at the anterior part of the brain, the surface of which shows a few shallow depressions, but no distinct sulci or convolutions. The only appearance of any attempt at division is to be found in a very slightly depressed line running in the middle of the under and part of the anterior surfaces. The posterior part of this mass is enveloped in pia mater, and a small choroidal plexus has been formed on either side of the middle line. An antero-posterior section through the middle of the front brain reveals a small horizontal cleft which appears to communicate with the third ventricle. The optic chiasma is replaced by a single nerve lying in the middle line and passing forwards through the single optic foramen into the orbit. Behind it lies a single

corpus albicans, also medially placed. The third, fourth, and sixth nerves are arranged in pairs. The author could not satisfy himself as to the exact anatomical relations of the olfactory bulb and nerve.

Without discussing the different theories that have been advanced to explain this single-eyed condition, the writer merely makes the briefest reference to them, concluding that the malformation has more probably arisen from an arrest of development, which has prevented the division of the different structures, than, as some would have it, from a blending together of parts originally separated.

This interesting paper is illustrated with several excellent plates, a minute inspection of which we cordially recommend to such readers as may be interested in the subject.

N. M. ML.

GILLET de GRANDMONT. The Microbic Nature of Deep Ophthalmias. *Archives d'Ophthalmologie, October*, 1892. *p.* 623.

Ocular complications are not rare in infectious maladies such as typhoid fever, erysipelas, and puerperal septicæmia, but as to the nature and origin of these complications pathologists are not yet entirely agreed. The author of this paper records some interesting observations which prove that, at least in some cases, the eye becomes secondarily infected with microbes which reach it through the circulation.

A man, aged 25, convalescent from typhoid fever, came under treatment for an iritis of the left eye with posterior synechia and hypopyon ; visual acuteness was reduced to finger-counting at one metre. The other eye was normal. The patient was very weak and thin, jaundiced, and, in spite of a milk diet, passed much albumen in the urine. Paracentesis of the aqueous chamber was performed with full

antiseptic precautions. By means of the needle a tube of agar-agar was inoculated with the aqueous humour and the pus of the hypopyon. Two days later a pure cultivation of the typhoid bacillus, giving all the characteristic reactions, was obtained. A minute quantity of this pure culture was then injected into the vitreous body of a rabbit. The vitreous became so opaque as to prevent illumination of the fundus, but at the end of eight days had partially recovered its transparency. The rabbit appeared in no way incommoded, and was supposed to have eliminated the poison, but on being killed three weeks later was found to have the liver and intestines infiltrated with this same bacillus. In the man the infection had evidently been carried from the intestine to the eye, and in the rabbit from the eye to the intestine.

The author refers in the next place to the ocular disorders which accompany or follow erysipelas. The neuritis, which under such circumstances may lead to total loss of vision, has been attributed to conditions of phlebitis, periarteritis, and lymphatic engorgement, acting more or less mechanically on the optic nerves. The author admits the possibility of this mode of action, but refers to cases in which bacterial infection of the eye appeared to be indubitable.

A woman, aged 46, while recovering from a third attack of erysipelas, suffered from hyalitis in both eyes, with numerous floating opacities and loss of fundus reflex. The right eye counted fingers at 30 centimetres, the left at one metre. Paracentesis was performed, and the needle was transferred to a tube of gelatine. Forty-eight hours later a characteristic culture of the streptococcus of erysipelas was obtained.

Lastly, the author refers to the well-known occurrence of septic hyalitis during puerperal septicæmia. He cites a case of this disaster after a miscarriage. Here the condition of the eye sufficed to justify the diagnosis of septicæmia before the onset of the peritonitis from which the patient died 48 hours later. In this case, however, although no doubt could exist as to the septic nature of the eye trouble, it was not possible to establish the proof as in the preceding cases.

The author concludes by urging (1) that in cases of

inflammatory disturbance in the interior of the eye the cause is sometimes to be found in antecedent infective diseases of the system; and (2) that in cases of diagnostic difficulty the question should be decided by paracentesis followed by bacteriological test.

P. S.

A. TÜCKERMANN (The Hague). **On the Absorption of Matter injected into the Anterior Chamber.** *V. Graefe's Archiv. XXXVIII.* 3, 60.

Tückermann assumes that the aqueous is secreted by the ciliary processes, and perhaps in part by the posterior surface of the iris, and that it passes into the anterior chamber through the pupil, and is only concerned with the course it follows in its escape from the eyeball.

It has been established by the researches of Schwalbe and Leber that, although no lymph-vessels in the strict sense are present, the aqueous passes at the angle of the anterior chamber into the circulus venosus and the anterior ciliary veins. This passage is effected, as Leber has shown, by a filtration through the network of the spaces of Fontana, and it is generally admitted that there is in this region a constant flow in the living eye. No fluid passes through the cornea so long as its endothelium is intact.

Brugsch in 1877 made experiments to ascertain if any perivascular or other lymph-spaces are present to assist the filtration angle in giving exit to the aqueous. The experiments are not conclusive in consequence of slight inflammation set up by the foreign bodies injected—Indian ink and cinnabar. However, Baumgarten and Morf have injected cinnabar, under antiseptic precautions, apparently without setting up exudation of leucocytes, and have found the particles of foreign matter subsequently in the parenchyma of the iris. From these experiments Morf has concluded that a lymph-space exists connecting the spaces of Fontana with the subconjunctival veins and the peri

choroidal space. This supposed lymph-channel is, Tückermann considers, merely the veins connected with the circulus venosus.

Staderini, experimenting with antiseptic precautions, obtained results somewhat similar to those obtained at an earlier period by Brugsch, viz., pigment granules in the iris tissue, mostly in cells, but some apparently free. These, however, do not prove the existence of lymph-vessels, but may be, as Brugsch supposed, deposited in delicate processes conneeted with the cells of the tissue.

Tückermann has endeavoured to finally settle the question whether the iris is or is not capable of absorbing free granules of foreign matter without the intervention of leucocytes. If it is, then free communications must exist between the anterior chamber and lymph-spaces in the iris.

The experiments were mostly made with Indian ink, specially prepared, and under strict antiseptic precautions. The immediate result was in all cases the formation of a fibrinous exudation on the surface of iris, sometimes covering the pupil, which gradually cleared away. After about four days a diminution in the amount of the Indian ink was plainly seen.

Microscopically, the aqueous was found to contain leucocytes within six hours of the operation, and these leucocytes gradually took up the foreign particles ; but even after two days free particles were still present.

The examination of the hardened tissue showed, in the cinnabar preparations, a fibrinous coagulum in the anterior chamber and adherent to the iris, though not universally. In these free portions of the iris the endothelial cells were found to contain foreign granules, and Tückermann cannot be positive that absolutely no particles occupied the intercellular spaces. The corneal endothelium also contained cinnabar particles, but no pigmented matter passed through the membrane of Descemet.

The fibrinous coagulum contained leucocytes which day by day took up into themselves the foreign particles. After six hours, pigments holding cells are found penetrating into the iris tissue, and the whole iris tissue is infiltrated with

them in forty-eight hours. These cinnabar holding cells penetrate into the ciliary processes also, but Tückermann never found any cinnabar granules in the interior of the blood-vessels, nor in the vascular walls.

The Indian ink preparations exhibited similar appearances, only more easily observed ; so that Tückermann can assert positively that no free particles of Indian ink were ever present in long rows as described by Staderini. If rows were present the granules were always in the cells, or, rather, in their long processes. It is not possible to assert that no free granules at all were anywhere in the tissue, but the general conclusion drawn from the preparation is that the foreign particles only penetrated the iris when carried into the tissue by the help of leucocytes.

A number of experiments was performed to ascertain the effect of injecting large quantities of Indian ink. The results were destruction of the eye by secondary glaucoma or perforation of the globe at the corneo-scleral junction, and infiltration of nearly all the intra-ocular tissues and of the conjunctiva bulbi with pigment granules. If a large piece of solid Indian ink were used, instead of the injection of Indian ink in suspension, a transitory local inflammation was the only result; and Tückermann concludes that an irritation caused by the particles of carbon is the cause both of this transitory inflammation in these cases and of the serious mischief resulting in the former cases. It does not seem to have occurred to him that it may not be impossible that the mechanical choking up of the filtration angle by the foreign particles *per se* sets up glaucoma, and that the glaucoma, and not the irritant action of the carbon granules, may be the cause of the intense reaction observed.

Tückermann concludes, in agreement with Brugsch, that injections of cinnabar or Indian ink cannot demonstrate the existence of lymph-spaces in the iris in communication with the anterior chambers: first, because a fibrinous exudation is produced which encloses the granules ; and, secondly, because the granules are taken up by leucocytes and carried off by them to the situations in which they are subsequently found.

J. B. S.

Galezowski (Paris). **Changes in the Ciliary Circle, and the Examination of this Region in Constitutional Affections and in Myopia.** *Ann. d'Oculistique. September*, 1892.

The ciliary circle consists of the anterior portion of the retina, the ora serrata, and the ciliary body—a region of the eye which has not, in the author's opinion, received sufficient attention from ophthalmoscopic observers. This neglect has arisen from the difficulty of getting a proper view of this region, and from the discomfort caused to both observer and patient by the attempt to examine carefully every portion of the ciliary circle. Dr. Galezowski attempts to supply what is lacking by giving the result of his observations on this region in health and in certain well-known diseases and constitutional states. For the purpose of making the examination as easy and complete as possible, he has had a lens of short focus joined to a very strong prism, which combination he uses presumably with the ophthalmoscope.

Where the vaso-motor innervation is defective, or where the vessel-walls are altered or disorganised, an increase in the intraocular secretion is produced, or the normal secretion is replaced by plastic or sanguineous exudation. This gives rise to an upheaving of the retina, and to its greater or less detachment in myopic eyes; or the exudation infiltrates the vitreous body in the form of numerous visible opaque flakes. This fibrinous effusion into the vitreous occurs in eyes which present no other change than choroidal atrophy in the ciliary circle; the association of opacity of the anterior part of the vitreous with changes in the ciliary circle is so constant that in making statistics of cases of the former the author found ophthalmoscopic evidence of change in the ciliary region in 98 per cent.

In the choroiditis of syphilitic origin there is a constant presence of atrophic patches at different points of the ora serrata in both the congenital and acquired varieties; in some

cases the author has been enabled to determine the syphilitic nature of an apparently simple iritis by the presence of choroidal changes in the ora serrata. Suspecting that the greater number of cases of tabetic atrophy of the optic nerves was due to syphilis, the author has been led to examine them carefully, and has found a large number of cases in which atrophy was accompanied by vascular and pigmentary changes at the ora serrata. Changes of a similar kind have been found in this region in cases of syphilitic perineuritis of the optic nerve running a slow course and leading finally to atrophy.

Tuberculous lesions of the ciliary circle present the characters peculiar to this diathesis—that is to say, small grey white elevations, with surrounding serous infiltration, and with pigmentary deposit here and there.

Gouty changes in the ora serrata are seen in the form of sanguineous effusions into the choroid or vitreous, sometimes accompanied by episcleritis; in some rare cases a similar effusion of blood has been seen in the lower part of the cornea or anterior chamber.

In myopia, as a rule, the principal changes are in the posterior segment of the eye, in the region of the optic nerve and yellow-spot, the rest of the eye being unaffected. But in a certain number of myopes, when there has been no change at all in the posterior segment of the eye, the author has found white isolated atrophic patches spread out here and there in this peripheral region. It is in these cases that there has been noticed a predisposition to the formation of peripheral or posterior polar cataracts, and, on the other hand, these patients appear to be protected from detachment of the retina, probably by reason of the cicatricial adhesions set up in the ciliary circle between the retina and choroid.

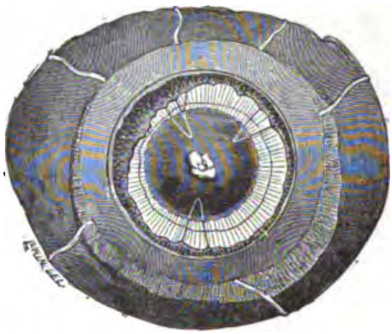
W. T. HOLMES SPICER.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

HENRY POWER, F.R.C.S., President, in the Chair.

THURSDAY, OCTOBER 20TH, 1892.

On Defects of the Iris in relation to Glaucoma.— Mr. Treacher Collins gave a lantern-slide demonstration of the microscopical character of three eyes with defects of the iris: (1) congenital absence of the iris and opacities in the lens; (2) congenital coloboma of the iris and lens out-



Anterior half of right eye of Case 1. The cornea and sclera have been peeled off, exposing a narrow rim of iris, some tags of pupillary membrane, and an anterior polar opacity of lens. (×2½.)

wards, with glaucoma; (3) traumatic aniridia and glaucoma. In the first specimen the ciliary body ended in a rudimentary iris in its entire circumference, although none could be seen before removal of the globe. On one side of the section a small piece of the sphincter muscle was present; on the other no such structure could be made out. The uveal

pigment on the back of the iris ended at the pupillary border in a double fold, and there were abnormal adhesions between the ligamentum pectinatum and the root of the iris, and remnants of the pupillary membrane. Besides other opacities in the lens, there was one at its anterior pole raised above the surface and evidently due to subcapsular proliferation of the lining epithelium.

Mr. Collins thought the arrest of development of the iris, as well as the other changes found in this eye, could be explained, as suggested by Manz, by an abnormal adhesion or late separation of the lens and cornea, which mechanically prevented the growth inwards of the iris. He pointed out that there was quite sufficient iris in this case to block the whole filtration area, should it have become pushed forwards, and that it was therefore quite possible for eyes in which no iris could be seen to become glaucomatous.

In the second case the filtration area in the region of the coloboma of the iris was found closed in more than half its extent by a small process with a double layer of pigment on its posterior surface, in which the ciliary body terminated. The ciliary processes opposite the cleft in the lens were directed backwards. This he thought due to the absence of any forward traction by the fibres of the suspensory ligament, which were probably wanting in that position.

In the third case there had been a wound of the cornea, through which the whole of the iris and a great portion of the lens had escaped eight and a-half months previous to excision. The eye became glaucomatous, with a deeply cupped nerve. There was a broad adhesion of the lens capsule to the corneal cicatrix. The advanced position the lens had thus taken up had drawn forward the ciliary processes, so that the most anterior of them were in contact with the cornea and blocked the filtration area.

Double Neuro-retinitis after Influenza.—Mr. Hartridge reported this case. The patient, a girl, aged 16, suffered from a severe attack of influenza in May, 1891, and a second but less serious attack in June, 1892. The latter illness was quickly followed by gradual and progressive failure

of vision. The acuteness of vision is now $\frac{6}{18}$ in each eye, with correction of some astigmatism. The patient has suffered during the past six weeks from constant headache on the right side. The optic discs are white, blurred, and rather swollen; arteries slightly diminished in size, veins somewhat tortuous, white lines along some of the large vessels, numerous bright scattered patches in the macular region, no hæmorrhages. There has been no evidence of renal disease; the patient is decidedly anæmic, but well nourished.

Messrs. Doyne, Hodges, and Juler referred to cases they had seen in which the ophthalmoscopic appearances closely resembled those present in Mr. Hartridge's patient, and in which there was a history of antecedent influenza.

Dr. James Taylor thought that in Mr. Hartridge's case the evidence as to influenza was not very definite, and suggested that the symptoms mentioned and the ophthalmoscopic appearances might be indicative of cerebellar disease.

Mr. Richardson Cross gave a brief account of three cases of optic nerve disease following attacks of influenza. In one the optic nerves were inflamed; in the other two they were, when seen by Mr. Cross, in an atrophic stage. All three patients were females, aged 20, 25, and 50 respectively. He felt satisfied that optic neuritis was occasionally caused by influenza.

Mr. Tweedy spoke of one of Mr. Cross's patients, whom he had also seen. He was of opinion that influenza bore a casual relation to some cases of neuritis, and not of the optic nerves alone. He had seen cases of paralytic strabismus following influenza which he thought were caused by a neuritis of the motor branches supplying the ocular muscles.

The Optical Condition of Fifty Persons who were free from any Ocular Disturbance.—Mr. Work Dodd read notes of observations on the sight of fifty individuals who had made no complaint concerning their eyes. The principal points brought out by his investigation were as follows: The average interpupillary distance, measured with a steel

metric measure, the eyes being directed to infinity, was 6·012 centimetres. The average convergence, measured from the punctum remotum by means of graduated prisms, was 1·24 metre angles; and for the punctum proximum, by the ophthalmo-dynamometer of Landolt, 10·86 centimetres; the amplitude of convergence being 11·08 metre angles. The punctum proximum of accommodation ascertained by the same instrument was for the right eye 10·10 centimetres, and for the left 10·38 centimetres; the amplitude of accommodation for the right eye 12·53 dioptres, and for the left eye 12·20 dioptres. The punctum proximum being nearer to the right eye in 24 cases, to the left in 15, and equal in 11. The amplitude was greater in the right eye in 28 cases, in the left eye in 17, and equal in 5. The visual acuteness and refraction, both before and after mydriasis, were obtained by means of Snellen's distant type and the ordinary trial lenses. Visual perception, before mydriasis, was more acute in the right eye in 15 cases, in the left eye in 12, and was equal in 23. After mydriasis it was more acute in the right eye in 15 cases, in the left in 14, and was equal in 21. The amount of ametropia preponderated slightly in the left eye. There was simple hypermetropia in 39 instances, and myopia in 1. Simple hypermetropic astigmatism existed in 1 case, and compound hypermetropic astigmatism in 4; 4 also were anisometropic. The oculation was dexter in 24 cases, sinister in 15, and indifferent in 1. This last point was determined by directing the patient to fix his eyes on a distant object, and then to hold up a small key or finger-ring at arm's length, so that he looked through it at the object. The ring in any case would be placed in the line of fixation of one particular eye, and the closing of that eye would make the ring appear to move quickly to that side, away from the object; while, on the other hand, the closing of the other eye would have no effect. To prevent the choice of hand exercising any influence on the experiment, the left was employed first in right-handed subjects, and *vice versâ*, but without modifying the result. The choice of eye being apparently determined by the absence of ametropia and the greater visual acuteness in one eye, more frequently the right.

Living and Card Specimens.—Mr. Power: Recurrent Spindle-celled Sarcoma of Lacrymal Gland.

Mr. Juler—1, Melanotic Tumour in Ciliary Region; 2, Retinal Hæmorrhage.

Mr. Doyne—1, Unusual Form of Keratitis; 2, Recovery from Albuminuric Retinitis of Pregnancy; 3, Atrophy of Lacrymal Gland.

Mr. Morton: Drawing of Cyst of the Iris.

Mr. Beaumont: Neoplasm (? Sarcoma) of Iris.

SYMMETRICALLY-PLACED OPACITIES OF THE CORNEÆ, OCCURRING IN MOTHER AND SON.

BY CHARLES A. OLIVER, M.D.,

ATTENDING SURGEON TO WILLS' EYE HOSPITAL, OPHTHALMIC SURGEON TO THE PRESBYTERIAN HOSPITAL, PHILADELPHIA, ETC.

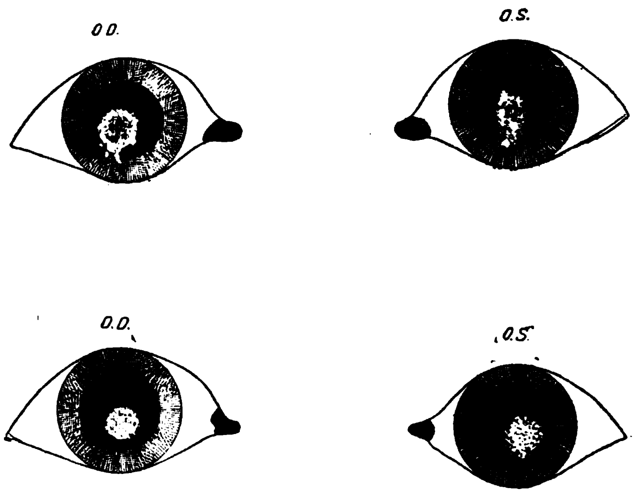
On the 23rd February, 1891, a sturdy-looking boy, eight years old, the son of German parents, applied at Wills' Eye Hospital for the removal from both eyes of what the physician who sent him supposed to be cataract.

The opacities, which had been noticed for a long time, had gradually increased in size and density, until one year previously, when, after an attack of malarial fever (the only illness that the child had ever had), they seemingly en larged and became just as they are now very conspicuous. At no time were the eyes ever red, irritable, or inflamed.

The upper incisors were normal in appearance, and the boy failed to present any of the facial or general characteristics of inherited syphilis. With two dioptres of hypermetropia and a slight degree of astigmatism in each eye, uncorrected vision was reduced to $\frac{1}{4}$, and the accommodative power was limited to eleven dioptres, while, with the exception of an esophoria of two degrees, no extra-ocular muscle disturbance was observable. The pupils were three millimetres in their horizontal meridians, and the irides were freely and equally mobile to light stimulus, accommodation, and convergence. The corneæ presented the dense superficial and deep

opacities so noticeable in the accompanying sketches, which were kindly made for me by Dr. B. Alexander Randall.

Careful examination of these drawings will at once make it evident that in each instance there is a deeper and more compact central area which is surrounded by an annulus or ring of superficial pin-dotted opacities, that of the left eye being the larger and the slightly



The upper figures represent the appearances presented by the eyes of the mother, the lower those of the son. The pupils are represented as dilated, in order to give the configuration of the opacities against a dark background as clearly as possible.

more peripherally situated. Not a trace of inflammatory vascularity could be seen. The eyegrounds, which were plainly visible and were most carefully explored, failed to reveal any gross changes.

Although physical examination gave no evidence of any organic disturbance, alteratives and local treatment were experimentally and persistently tried; yet up to the present time, nearly sixteen months after the first

visit, no perceptible change in appearance of the corneal spots is evident.

During the first weeks of the study of this case it was thought advisable to examine the mother, who was a widow, and her other child, a daughter of fifteen years of age.

The sister of the patient failed to exhibit any ocular abnormality, except a minor degree of simple hypermetropic astigmatism.

The mother, however, a seemingly healthy woman of forty-five years of age, without any apparent organic lesion or history of pronounced illness, stated that she had had, as long as she could remember, a difficulty with her eyes, which was apparently similar to that of her son. Completely free from any evidences of other gross ocular lesion, her corneæ presented the peculiarly circumscribed deep and superficial opacities shown in the upper part of the sketch, they being more irregular in outline, and their central portions much fainter, than those of her son.

The apparent heredity in the two cases is almost certain, when we consider that here we have a seemingly healthy woman with long-standing peculiarly-localised and symmetrically-placed opacities of the cornea, who, although having a daughter as yet unaffected, has her ocular infirmity directly repeated in an otherwise healthy son; a similarity in two of the most impressionable of blood relations—mother and son—in whom, in spite of all attempts at solving the problem by the most scrutinising search into family and personal history, the most careful general and local examination, and the most persistent and prolonged antidyscratic treatment, I have so far entirely failed to find any clue as to the true meaning of the case.

HÆMORRHAGE INTO THE VITREOUS, ASSOCIATED WITH EPISTAXIS.

By W. M. Beaumont,

Surgeon to the Bath Eye Infirmary.

The following case, although not furnishing any unique facts, is, I think, worthy of record :—

R. W., æt. 23, grocer's assistant, came to me, giving the following history :—His father was living and healthy ; his mother dead—cause unknown. His parents were not blood relations. One brother suffers from epistaxis. His general health has always been good, and he has never suffered from gout, rheumatism, dyspepsia, or constipation. The heart-sounds were normal, and there was no apparent increase of pulse-tension. He lived an extremely sober and steady life. The only complaint he made was of epistaxis, from which he suffered every spring and summer, and it was usually preceded by headache. In the summer of 1890 the nose-bleeding was very frequent, recurring sometimes two or three times daily, and especially on Saturdays, when he was most busy in business. (The shop was lighted by electricity.)

Present Attack.—In April, 1891, he had an attack of epistaxis, the first this year. Three weeks later he noticed that the right eye was inflamed, and that its sight was dimmer than usual, although he had observed that he could read only large type with that eye for about eight years. The eye became very painful, and he came to me on May 9, 1891, when I found the pupil dilated, no vision, and T = + 1. The fundus was quite dark, except for a little peripheral red reflex, which could be clearly seen by oblique illumination. He was ordered eserine and cocaine drops ; the pain quickly subsided, but the tension remained plus, and the pupil did not contract. There was not much further change until June 26, when the anterior chamber was seen to be partially filled with liquid blood, evidently due to a

recurrence of the hæmorrhage. The hyphæma entirely disappeared in a few weeks, and during the next three months the eye somewhat improved. A red reflex was seen behind a dark network, and vision was now equal to perception of light. The bowels all through the summer had been kept well open, although there was at no time any tendency to constipation. There had been no return of the epistaxis, a circumstance which he considered very remarkable. In October, absorption had progressed still further, and he could readily distinguish shadows. In January, 1892, a pale reflex was observed, but no details of the fundus could be made out. Since then I have not been able to see him, but I have heard that there has been no recurrence in either eye.

The predisposition of some young men to spontaneous intra-ocular hæmorrhage was, I believe, first recorded by von Græfe in 1854, and more recently attention has been directed to similar cases by Eales,* Hutchinson †, and Gontard ‡.

Panas looks upon them as cases of "ocular epistaxis," and has pointed out the fact that the source of the hæmorrhage in the young is from the retinal veins, whereas in the old intra-ocular hæmorrhage is due to rupture of retinal arteries.

Associated with these cases we usually find a tendency to epistaxis, constipation, and headache. There is frequently disease of the heart, especially hypertrophy, together with a deviation from the normal of the pulse-tension; in some cases an increase, in others a decrease. Most of the patients have been young men; but it is not unknown in young women, with whom, however, men-

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* *Birmingham Med. Review*, 1880; *Trans. Internat. Med. Congress*, 1881; *Ophthalmic Review*, 1882.

† *Trans. Ophth. Soc.* i. 26, 181; *Ophthalmic Hosp. Reps.* xii., 201, 1889.

‡ "Des Hémorrhagies Spontanées de l'Appareil de la Vision chez les Adolescents." Thèse de Paris, 1891.

struation usually seems to act as a safeguard. With regard to age, the youngest I can find recorded was fourteen, the oldest twenty-nine, and the average age of 22 cases was nearly 19½ years. Epistaxis is recorded as having been present in 16 cases, and absent in one. Headache present in 11 cases, absent in three. There was heart disease in eight patients, none in one. The right eye was affected three times, the left six times, and both eyes ten times. Constipation occurred in eight cases, but was absent in three. Dyspepsia was complained of by four patients. With regard to causation, Hutchinson is inclined to think that gout is a factor, Eales dwells upon the constipation, and Gontard throws the blame upon hypertrophy of the heart.

Much may be done to prevent recurrence by means of treatment. Dyspepsia, if present, should be attended to, and habitual constipation overcome by a daily saline. If there is hypertrophy of the heart or increased pulse tension, the case should be sent on to the physician for appropriate treatment. In case of a sudden cessation of a frequently-recurring epistaxis, especially if headache were present, I should be inclined to try venesection, repeating it at intervals if the headache were relieved.

Prognosis in these cases is not hopeful; the eye may recover a useful amount of sight, and in some it clears up entirely, but there is always the great probability that a relapse will occur in the same, in the other, or in both eyes.

A. Darier (Paris). Subconjunctival Injections of Corrosive Sublimate in the Treatment of Various Diseases of the Eye. *Archives d'Ophtalmologie*, 1891, *p.* 449. *Extrait du Bulletin de la Soc. d'Ophtalmologie de Paris*, 1892. *Extrait des Comptes Rendus de la Soc. Française d'Ophtalmologie*, 1892.

V. Moll (Rotterdam). The Local Treatment of Diseases of Non-superficial Tissues. *Klin. Monatsbl. fur Augenheilk. October*, 1892, *p.* 329.

In the three French papers to which reference is given above, Darier records the results which he has obtained by a very extensive employment of a method of treatment which is practically new.

The idea which underlies the method is that when any organ of the body is suffering from a localised infective process, the requisite medicament will be employed to greater advantage by a direct and concentrated application to the diseased organ than by a general distribution of it throughout the system. The eye presents peculiarly favourable conditions for the fulfilment of this idea, and for the scientific observation of the results obtained. We cause dilatation of the pupil by effecting a local absorption of atropine and eserine; no one would dream of saturating the system with these drugs in order to produce their localised action within the eye. Such instillations into the conjunctival sac are efficient, however, only in the case of certain alkaloids which act in extremely minute doses. The direct injection of a solution into the vitreous body is not entirely without danger. A sub-conjunctival injection is more efficient than a simple instillation, and is free from the danger which attends a puncture of the globe. That absorption by the media of fluid thus injected occurs with rapidity is demonstrable by the use of a coloured fluid. The method is therefore rational, and its experimental application with due precautions is fully justified.

It is, of course, not altogether new. Rothmund in 1866

recommended the subconjunctival injection of common salt in the treatment of corneal opacities. Gallenga proved that phlyctenular ulcers of the cornea could be artificially produced by the sub-conjunctival injection of micro-organisms, and Secondi thereupon employed subconjunctival injections of corrosive sublimate in corneal ulcer with good results. Reymond employed similar injections with success in sympathetic irido-cyclitis.* Snellen has obtained good results in episcleritis by the same method.†

Darier expressly gives the credit of priority to Secondi. From him he took the suggestion of applying a medicament locally to the eye by means of subconjunctival injection. His own investigations, however, seem to have been much more extensive than those of his predecessors.

The following is the method: The solution of the perchloride has a strength of 1 in 1,000, and is made with boiling water, and filtered without the addition of alcohol. The syringe is sterilised, its point exceptionally sharp. The quantity of the solution injected varies from 1-20th to 1-10th of a cubic centimetre, the latter dose containing 1-10th of a milligramme of sublimate. (In the original paper, by an error which might prove seriously misleading, the contained quantity of sublimate is said to be 1 milligramme). The English equivalent of the prescribed dose is, roughly, 1 to 2 minims (accurately, ·85 to 1·7 minims) of the 1 in 1,000 solution. A few drops of cocaine solution having been used to the conjunctiva, the injection can be made without pain, and without either speculum or fixation forceps, provided the point of the syringe be sufficiently sharp. Some smarting and discomfort are felt as the effect of the cocaine passes off, but are of short duration. The first and second injections may be made with an interval of two days, the one being above the cornea and the other below it. A third may be made three or four days later at the inner side; a fourth later

* For detailed references to the several original papers, see the footnotes to van Moll's article referred to above.

† *Transactions of Ophthalmological Society of United Kingdom*, vol. x., p. 209.

still at the outer ; so that four injections may be given within a space of eight or ten days. The whole series may be repeated when the conjunctiva has resumed its normal aspect.

In four cases, out of a large number treated, complications were set up—chemosis, photophobia, sharp pain, and even hypopyon. Possibly this was attributable to an imperfectly cleansed needle ; more probably, to individual peculiarities and to unsound conditions of the eye. In all these four cases the eyes were already blind through irido-choroiditis.

Darier's first paper deals chiefly with the results obtained in diseases of the iris and ciliary body. Eleven cases are recorded. In nine of these there was well-marked improvement. They included cases of iritis with hypopyon, with gummata, with nodosities which were possibly tubercular, with keratitis punctata, with increased tension, and, in two instances, with signs of infection from without through a bulging cicatrix resulting from accident or operation. The cases which proved least amenable to treatment were those of the sub-acute irido-choroiditis of long duration, which is met with chiefly in lymphatic subjects. In the grave forms of irido-choroiditis met with in old syphilitics the injections gave surprisingly good results.

Successful results in various inflammatory conditions of the cornea are also related. Recurring to this part of the subject in the second paper referred to above, Darier says that not one of the older methods acts with such rapidity and intensity on certain infective processes of the cornea. In nearly all forms of corneal infiltration originating in erosion of the epithelium, followed by infective inoculation, hypopyon-ulcer, etc., and in cases of circumscribed parenchymatous keratitis, the subconjunctival injections give excellent results.

We are told, further, that very satisfactory results were obtained by this local treatment in cases of infectious inflammation of the optic nerve, especially in presence of the characteristic central amblyopia. In the case of atrophy of the optic nerves due to syphilis, and in another of atrophy

secondary to syphilitic choroido-retinitis, considerable improvement was obtained after classic methods of treatment had remained without the least effect for months.

In his third paper Darier enforces his conclusions by presenting a series of sketches showing changes in the fundus oculi in cases which he had treated, and details of the acuteness of vision before and after treatment in each case. He deals here chiefly with diseases in the region of the macula. In disease of the macula it is especially important to obtain a therapeutic effect both rapid and intense, and this can be best achieved, he assures us, by the subconjunctival injections. In cases of central choroiditis, when vision was not already irrecoverably lost, the improvement was so rapid as to prove its dependence on the treatment of the cases thus benefited; only a very small number were attributable to syphilis; three were probably gouty; but as to the precise ætiology of the cases he refrains from positive statements.

Encouraged by success in other forms of central choroiditis, Darier tried injections also in cases of alteration at the macula in myopia, and he claims that when it is possible to treat such a case soon after the macular change has made its appearance, a great improvement of vision may be obtained.

The interest and surprise which these communications naturally arouse are not lessened when we find a number of other ophthalmologists coming forward to state an equally favourable experience. At the meeting of the French Society of Ophthalmology, of May, 1892, Dufour declared that he had practised these injections hundreds of times, and considered them the most active means of combating an infective keratitis. Abadie believed that in certain cases this treatment was more powerful than all others, and would save eyes otherwise doomed to blindness. Coppez spoke in the same sense, declaring that he had obtained marvellous results in cases which had proved intractable for years under other methods of treatment. Among them was one of sympathetic ophthalmia. He would have this method tried in all rebellious diseases of the eye, such as old keratitis, irido-choroiditis, and even in atrophy of the optic nerve, resulting

from choroiditis or retinitis. He injects a larger quantity of the solution than Darier has prescribed, and raises the question whether the results obtained are not due, in part at least, to the quantity of fluid injected, rather than to the mercurial salt contained. Chibret confirmed the facts advanced by Darier. Two speakers finally, Despagnet and Vignes, took a less hopeful view of the matter, the latter declaring that, especially in the cases of macular disease, the improvement which the patients often said they had derived would not stand the test of an accurate investigation.

Van Moll, in the article referred to above, takes up the same subject. He declares as the result of his own experience, that subconjunctival injections of sublimate have excellent effects in the most various cases of iritis and irido-cyclitis, and are useful also in diffuse keratitis. He has found also that similar injections of salicylate of soda are useful in scleritis, and in the milder cases of diffuse keratitis. P. S.

ALLVAR GULLSTRAND. **Objective Method of Diagnosis in Paresis of Ocular Muscles.** *From the Swedish Acad. Vol.* 18, *Pt. IV., No.* 5.

This paper describes a purely objective method for the diagnosis of paresis of the ocular muscles. Up till now the differential diagnosis of these affections has depended almost entirely upon the subjective method based upon the character of the diplopia, and it needs no argument to demonstrate how tedious, troublesome, and uncertain this method is in many cases, and how impossible to satisfactorily work with in some.

Gullstrand's method consists in a systematic comparison of the corneal reflections, as seen in the pupils when the eyes are rotated in the various meridians of the fields of fixation. The corneal reflection above is the same object as has been used by different observers in estimating the

amount of strabismus (*vide* Priestley Smith's paper, O. R., Vol. VII., p. 349). The author devotes considerable space to showing that the relative position of these two objects, the corneal reflex and the pupil respectively, is a sound and satisfactory test of the movements of the eyeballs. It is well known that a corneal reflex changes its position in the pupil when the eye moves, and the reason that it does so is that the two objects, reflex and pupil, lie at different levels in the eyeball. If we assume that the corneal reflex lies on the line joining the eye observing and the eye observed, it must be on the line drawn from the observing eye to the centre of curvature of the observed cornea ; so that we may assert, as a general principle, that when the reflex lies on the observer's visual line, the position of the visible corneal reflex in movements of the observed eye coincides with the centre of its corneal curvature. By which is meant not that the reflex actually lies at that point, but that its apparent position alters in movements of the globe as if it were situated at that point. This general principle, however, can only be applied to the reflex from the portion of the cornea near its centre, as it is only in that region that its curvature approximates closely enough to that of a sphere.

The object whose position is compared with that of the corneal reflex is the centre of the pupil, which, owing to the refraction of the aqueous and cornea, appears to lie about 3·26 mm. behind the cornea. This is strictly true, only when the line, which passes through the centre of the pupil, coincides with the observer's visual line, as spherical aberration affects the calculation in other positions. We have then two objects to compare : the corneal reflex, whose apparent position is at the centre of the corneal curvature, or 7·8 mm. behind the cornea ; and the centre of the pupil, which is 3·26 mm. behind the cornea, or about 4·5 mm. in front of the former.

It may therefore be laid down that when the corneal reflex lies on the observer's visual line, its position in a small-sized pupil changes on movement of the observed eye as if the pupil had made an equal angular movement round the corneal reflex as centre at a distance of 4·5 mm. as radius. If the movement of the eye is defective in any given direc-

tion (paresis or paralysis), the reflex does not change its position in the pupil as it does in a normally-moving eye, and it appears displaced towards the side of the defect—viz., towards the affected muscle—just as the false image in diplopia is displaced. This displacement affords an objective test of paralysis of a muscle, which supplements, or rather renders unnecessary, the usual subjective test of diplopia.

Two objections may be raised : firstly, that the method is not sufficiently delicate to detect small defects in ocular movements, those, in fact, which produce the most distressing diplopia; and, secondly, that it cannot help in those cases where the oblique position of the double images is a material point in forming a diagnosis. As regards the latter objection, Gullstrand asserts that the obliquity of the double images is not a necessary observation in the diagnosis of uncomplicated cases, as the diagnosis can be made easily without regarding it, and in presence of the least complication the obliquity fails to afford the information we desire. It cannot be observed sometimes in cases where it should be manifest, and it is present in others where it should be absent—for instance, in paralysis of external rectus.

In testing by the objective method, we must not restrict ourselves to observations of defective movements, starting from the primary position only. As the objective method takes no account of rotations of the globe round the optic axis, it is necessary to place the eye in such a position that the superior and inferior recti and the obliques can only act as elevators or depressors of the corneal centre. This is, of course, effected by abduction and adduction respectively. In abduction the superior and inferior recti can only elevate or depress the corneal centre, and in adduction the obliques perform this office.

It is always best to have the observer's eye, the luminous object, and the patient's fixation-point stationary, and let the movements be effected by rotation of the patient's head. A window can be used as luminous object, or a white card with a central perforation, as in keratoscopy, or a laryngoscopic mirror (the ophthalmoscopic mirrors are not large enough to produce a reflex image on both corneæ at once), but the two eyes (observed and observing), the fixation-point, and the

source of light should, so far as possible, be in the same straight line.

Gullstrand prefers the window as object for reflection, and proceeds as follows :—The patient is placed so far from the window that the corneal image is seen within a moderately contracted pupil. The observer first determines the presence of binocular fixation, and then alters his position until the reflexes are seen symmetrically in the two pupils. The absence of binocular fixation may at once enable the diagnosis to be made, but further examination is always desirable, and often absolutely necessary. Usually four movements are sufficient, bending forwards and backwards, and turning the head to the right and to the left; but if the case is complicated, the diagonal positions must also be investigated. Although it seems hardly necessary in an ophthalmic periodical, it may be well to reproduce Gullstrand's complete list of defective movements and their respective causes.

A. Horizontal asymmetry, on looking to the right shows lesion of a muscle turning the eyes to the right. (1) The reflex in right pupil deflected to the right (or in the left to the left) shows lesion of right ext. rectus (or weakness of that muscle in fixation with right eye, and secondary deviation of left eye). (2) The reflex in left pupil deflected to the right (or in the right to the left) shows lesion of left int. rectus (or weakness of that muscle in fixation with the left eye, and secondary deviation of right eye).

B. Horizontal asymmetry, on looking to the left shows lesion of a muscle turning the eyes to the left. (1) The reflex in left pupil deflected to the left (or in right to the right) shows paresis of left ext. rect. (or weakness of that muscle in fixation with left eye, and secondary deviation of right eye). (2) The reflex in right pupil deflected to the left (or in the left to the right) shows lesion of right int. rectus (or weakness of that muscle in fixation with right eye, and secondary deviation of left eye).

C. Vertical asymmetry, on looking upwards shows lesion of some one of the elevating muscles. (1) The reflex is higher in right pupil. (*a*) Looking to the right side shows lesion of right superior rectus. (*b*) Looking to the left

shows lesion of right inferior oblique. (3) The reflex is higher in left pupil. (*a*) Looking to the left shows lesion of left superior rectus. (*b*) Looking to the right lesion of left inferior oblique.

D. Vertical asymmetry, on looking downwards, shows lesion of a depressor muscle. (1) Reflex lower in right pupil. (*a*) Looking to the right, shows lesion of right inferior rectus. (*b*) Looking to the left shows lesion of right superior oblique. (2) The reflex is lower in left pupil. (*a*) Looking to the left shows lesion of left inferior rectus. (*b*) Looking to the right shows lesion of left superior oblique.

This simple test is sufficient to differentiate paralysis of any one single muscle, and even more complicated lesions—for instance, if two associated lateral muscles are affected, the reflex will be deflected towards the affected side in both pupils in movements in that direction. Again, as symptoms of lesions in lateral muscles are only present in horizontal movements and of elevators or depressors in vertical movements, the lesions of one group can be distinguished from those of the other, even when both groups are affected.

It is only when, by complete paralysis of one lateral muscle, movement in that direction is absolutely impossible that difficulty is experienced. But suppose, with complete paralysis of the right ext. rectus, an elevator is also paralysed on that side. If the vertical deflection of the reflex is seen on looking to the left, the inferior oblique must be the muscle affected ; if it is not seen, then the superior rectus is affected. If both lateral muscles of the eye are completely paralysed, the lesion of an elevator will deflect the reflex either upwards and inwards, or upwards and outward. In the first case the affected muscle is the superior rectus, in the second the inferior oblique.

Certain combinations of elevator and depressor lesions necessitate testing in the diagonal positions. Suppose horizontal movement normal, and reflex in right pupil deflected upwards on looking upwards, and downwards on looking downwards. Then there is a lesion of both an elevator and a depressor, and the muscles are antagonists—either the two recti or the two obliques. If the deflection exists on looking to the right, and then raising or lowering the eyes, the recti are

affected—if, on the contrary, it shows itself on looking to the left and raising or lowering the eyes, the obliques are affected.

Further still more complicated cases are discussed with a view to showing the utility of the objective test.

One marked advantage of the method is that its results can be shown photographically, and Gullstrand's paper concludes with 29 excellent photolithographs of actual cases, of which he gives a detailed description in the text. The plates are quite sufficient vindication of the method against the first of the two objections mentioned above.

J. B. S.

Kalt (Paris). **Two Cases of Death following Enucleation in Chronic Panophthalmitis.** *Annales d'Oculistique, Sept.*, 1892.

Kalt in this paper adds to the record of these lamentable cases; in one of the two instances reported, however, there is sufficient doubt as to the exact relation the operation bore to the fatal illness to make one hesitate to regard them as cause and effect.

Case 1.—A healthy countryman, æt. 59, came under Kalt's care at the Quinze-Vingt Clinique, on July 20, 1891, suffering from a large infective ulcer of the right cornea. Perforation had occurred, and the iris and some portions of vitreous protruded. There was moderate chemosis. No dacryo-cystitis. The symptoms had existed for three months. The patient complained of severe pain in the eye and seemed feeble.

The eyeball was enucleated at once; no difficulty occurred at the operation; the capsule of Tenon was somewhat thickened; the orbital tissues appeared normal. The wound was carefully cleansed with sublimate lotion, a suture put in, and iodoform dressing applied.

Twenty-four hours later the patient had a rigor, temperature 39·5° C. The wound was perfectly normal; no

swelling, no pain. The incision in the conjunctiva was reopened, and the cavity irrigated with sublimate solution. On the two succeeding days (July 22 and 23) there were fever, violent cephalalgia and low delirium; on July 24 coma and death.

Immediately after death the orbit was carefully examined, but no abnormal reaction or trace of pus could be discovered.

The autopsy was made twenty-four hours after death, and the following conditions found: orbit normal, chiasma unaffected; no pus in the basal sinuses, nor in the optic nerve-sheaths; no exudation at the base of the brain. On the convexity of the hemispheres a purulent subarachnoid exudation, extending from the anterior part to the fissure of Rolando. About the middle part of the second frontal convolutions the purulent layer was thick, and formed a whitish patch as large as a five-franc piece. Simple hyperæmia of the grey matter. No abscess in the cerebral substance. Nothing abnormal in joints, lungs, liver, spleen, or kidneys.

Microscopic examination of the meninges stained by Grain's method discovered a pure growth of cocci identical with those found in pneumonia. The grey matter of the cortex was free from micro-organisms.

Examination of the Excised Eye.—Hernia of vitreous body; absence of crystalline lens. Purulent hyalitis and choroiditis. Numerous groups of the round microbe of suppuration in the anterior part of the vitreous; none in the cornea. No cultures could be made, the eyeball having been placed in alcohol.

Kalt considers this case as one of metastatic purulent meningitis, which began, without doubt, on the day of the operation. The infection apparently did not spread directly from the orbital wound to the meninges; and Kalt suggests two possible explanations; one, that the micrococci had travelled by some unknown path from the eye to the subarachnoid space, and had lodged there, becoming active only as a result of the operation; the other, that the microbes were carried in the veins, in the form of emboli. The traction and pressure exerted upon an eyeball during

enucleation might easily dislodge small masses of white blood-cells from the choroidal veins.

Case 2.—A boy, aged 6 years, struck in the right eye by a knife, August 28, 1891. When seen the next day, there were, a penetrating wound of the ciliary region, a small hernia of the iris, abundant hæmorrhage into the anterior chamber. An antiseptic dressing was applied. The boy was not seen again until October 21, at which date the eyeball was shrunken, irritable, and painful. It was enucleated, the wound dressed with sublimate and iodoform. The boy left the hospital on the eighth day. Nine days later severe vomiting came on; this was followed by delirium, coma, and death in 48 hours. Inquiry subsequently elicited the statement from the relatives that for some days before the sickness came on the lad had been restless, irritable, and turbulent. The condition of the orbit was apparently normal. No post-mortem examination was obtained. Examination of the excised eyeball showed a chronic purulent hyalitis and choroiditis.

The possible fallacy in this case lies in the fact that there was scarlet fever in the house in which the boy lived, and that he had been in contact with the affected inmates. Kalt suggests that the acute meningitis which killed the patient may have had a scarlatinal origin, but his own opinion is adverse to this view.

J. B. L.

J. P. Nuel (Liège). Filamentary Keratitis. *Archives d'Ophtal. Oct.*, 1892.

The form of keratitis here described has been till recently more or less confused with those badly differentiated forms known as herpes of the cornea and vesiculous or bulbous keratitis. In 1882 Leber described, for the first time, the characteristic structure of certain filaments which are found adherent to the corneal surface in some cases of keratitis. Since then Uhthoff, Fischer, Czermak, Hess, and the author of this paper have written on the same subject. The author has examined these filaments in all stages of development, and carried the investigation of them further than any other observer, by tracing their manner of origin, and examining carefully the corneal base from which they arise.

The affection shows itself most frequently in old persons, without any cause more obvious than prolonged congestion of the conjunctiva ; cases have, however, been seen among the young. Generally, only one eye is affected, and, as far as can be judged, the special growths are localised in one sector of the cornea ; in rare cases some appear on the limbus or on the conjunctiva of the globe.

It would seem that a distinction must be made between the idiopathic cases in which the excrescences are primary and those in which the excrescences arise from the altered surfaces of corneal ulcers. At present only the primary filamentary growths are discussed. The author's statistics, like those of Uhthoff, show that one case is found in every six thousand of disease of the eye.

Preceded by a train of symptoms of moderate ciliary and conjunctival irritation, there appear in a sector of the cornea one or more spherical elevations, at first very small, but afterwards growing to, and even exceeding, the size of a pin's head. These little spheres are transparent, regular, and glistening ; they may easily be taken for little vesicles. About the second day the spherule is transformed into a filament, ¼ to ½ cm. or more in length, its thickness varying from ¼ to 2 mm. Sometimes a spherule is attached by a very delicate,

hardly perceptible elastic pedicle, and is swept about by every movement of the eyelids.

Sometimes a depression is seen on the surface of the cornea, which may be taken for a little ulcer ; it is not an ulcer, but is produced mechanically by the spherule being pressed by the lid against the cornea, without making a breach of surface.

The filaments disappear in a few days, swept off by the lids, and the cornea becomes normal; the symptoms of irritation reappear after an interval, which may extend to several weeks, and a new crop of filaments is then formed; in one case the succession of crops went on for a year and a half, in spite of all remedies.

The detached corneal filaments seem, under the microscope, to be made up of two very distinct parts, an axial part extending through nearly its whole length, consisting of fibrils twisted together to form a rope. The envelope of the rope varies much in size; it has a striated, more or less fibrillary appearance. The fibrils vary in direction; they may be longitudinal, transverse, or rolled spirally round the central rope. Elongated nuclei, more or less distinct, are found inserted between the fibrils of the rope; nuclei and fusiform cells are found also in the envelope. Part, at least, of these cells have an epithelial origin, but some of them are migratory, deposited from the conjunctival mucus. If one of the filaments be removed, with the superficial part of the cornea forming its base, and examined in glycerine or a solution of acetate of potash, the envelope will be found to cease at a small distance from the epithelial surface of the cornea. The rope alone is inserted into the cornea, gradually spreading out into the epithelial layers; the corneal insertion of the rope presents the appearance of a whorl of fibres radiating generally, but preferably in one or two directions. It will be seen that, as they approach the fibrillary whorl, the superficial cells of the cornea become more and more fusiform, the nuclei lengthen at the same time; the cellular outlines are more and more effaced, till finally only long nuclei can be seen buried in fibrils.

The filaments of which the rope is made have a sensible diameter. Each one of them is an attenuated, elongated

epithelial cell containing a nucleus; the central cable is always composed of at least two bundles, made up of epithelial fibres more or less twisted into a spiral; the bundles themselves are spirally twisted round each other, but remain distinct in their whole length.

It is not easy to understand the formation of these filaments without the clear illustrations given by the author, but the process consists, essentially, of a gradual elongation of the surface epithelial cells of the cornea at one point into fibrils, which are thrust forward into an elevation, and twisted on each other to form a rope.

The manner of formation of the envelope is not easily made out; it appears to consist of epithelial cells shed from the cornea, which have undergone mucoid or fatty degeneration, and of cells deposited from the conjunctival sac.

There still remains the difficulty of finding the primary origin of the fibrillary whorl or rope. If the epithelial surface of a corneal lamella be spread out under the microscope, there will sometimes be seen long rectilinear lines of fusiform cells; on each side of the lines the normal epithelial cells will be seen to be gradually transformed into more and more elongated spindle cells as they approach the lines. Sometimes two of these lines meet, and from the meeting-place arises a point, which gives origin to a filament. The elevation, once started, continues to grow, partly by the elongation of its constituent cells, and partly by the growth of cells behind it. This formation, then, is, in the main, the result of an abnormal hypertrophy of the epithelial cells, which are not cast off by desquamation in the ordinary way. At first sight, the twisting of the filament would seem to be due to the mechanical action of the lids; it may be so. It is, however, interesting to note that in forty formations of this kind, taken from the left eye of the same individual, the twisting was invariably from right to left.

From an examination of the chemical characters of the filaments the author concludes that the elements of the central cable are gradually transformed into keratin, while those of the envelope undergo mucoid change. The superficial layers of corneal cells alone take part in the change; those of the deeper layers remain perfectly normal.

Filaments arising from corneal ulcers.—Various authors have described cases in which filaments have arisen from the surface of ulcers; in a large number of instances these filaments are of the nature already described. The observers seem to have been misled into admitting the existence of an ulcer, by the pit produced by the pressure of the spherule against the cornea. It is, nevertheless, true that typical filaments can arise from the surface of a corneal lesion; further research alone can decide whether certain of these filaments are not simple shreds of mucus without a central cable.

W. T. HOLMES SPICER.

R. J. **PHILLIPS** (Philadelphia). **Spectacles and Eye-glasses: Their Forms, Mounting, and Proper Adjustment.** *Philadelphia: P. Blackston, Son & Co.*, 1892.

To succeed, the surgeon must not be content with directing what shall be done: he must see that it is done, and done efficiently. It is wise for one who prescribes glasses to see that his prescriptions are properly fulfilled—not only that the proper glass is furnished, but that it is in all respects properly mounted. Without this, as Dr. Phillips says, "the most painstaking measurement of the refraction will frequently fail of practical result." Hitherto the ophthalmic surgeon has had to learn what he could as to the mounting of correcting lenses through his own failures to give relief by carefully-chosen lenses, or by those of his *confrères*. The book before us occupies a new field in ophthalmic literature, and presents its subject so well that it will be welcome to all who have given thoughtful attention to the practical correction of ametropia. There is much in it, too, that should be of interest to the practical optician, all the more interest, perhaps, because the subject is approached from the standpoint of the surgeon.

The scope of the book is indicated by the following headings of subjects discussed: Materials, component parts and methods of manufacture of frames and lenses; principles of centering and decentering lenses, and relation of the visual axis to the plane of the glass; measurements required for the accurate fitting of frames; and the inspection and adjustment of the finished spectacles and eye-glasses.

The introduction of several pages has little special connection with the subject of the work, being occupied with a history of spectacles from the days of Nineveh to the time of Benjamin Franklin and George Airy. Here we find the rather glaring omission of any allusion to the observations of Thomas Young upon his own astigmatism, although otherwise it seems to be a good presentation of the fragmentary information obtainable upon the subject.

The literary style of the book is notably simple and good, and it is fully illustrated and fairly printed.

S. Weinbaum (Göttingen). A case of Hæmorrhagic Glaucoma with Thrombosis of the Central Retinal Vein and Ectropion Uveæ. *V. Graefe's Archiv. XXXVIII.* 3.

Before entering into any particulars concerning his own case of thrombosis of the central retinal vein, the author refers briefly to the few which have already been described.

Michel has reported seven instances observed ophthalmoscopically, and one in which he was able to make a microscopic examination. The patients were of ages varying from 51 to 81 years, and all suffered from definite affection of the circulatory system; none, however, from albuminuria. The onset of the disease was always sudden, and its course resembled, more or less closely, that of embolism of the central retinal artery, the symptoms, however, being less serious, and the percentage of recovery greater.

Michel classifies the condition under three heads—viz.

(1), a complete blocking of the central vein ; (2) a partial blocking; and (3) an interference with the flow so slight as to cause only a venous congestion.

Retinal hæmorrhage was present in all the cases, and usually in a degree directly proportionate to the amount of obstruction. Increase of tension was never observed. In the one instance in which sections were cut the central vein was found to be completely blocked by an organised thrombus, which was closely adherent to the venous wall. The retina was destroyed, owing to œdematous and other changes, but the lumen of its vessels was everywhere uninterrupted, while at the same time perivascular changes were noticeable. There was no swelling of the disc. Michel ascribes the thrombosis to a proliferation of the endothelium of the vein, the generally impaired condition of the whole vascular system being, of course, a predisposing cause.

Angelucci has advanced a different view, and cites three cases whose origin he believes to be phlebitic or periphlebitic. His patients were much younger than Michel's—from 23 to 26 years—and all were the subjects of cardiac valvular disease. The onset of blindness was quite sudden in each instance. Ophthalmoscopically no retinal hæmorrhages were observed ; the veins were tortuous and of varying width in different parts of their course: in one case there was venous pulsation with a cherry-red spot at the macula lutea. In two of the three cases the microscope revealed a thrombus of the central vein close behind the lamina cribrosa. The walls were thickened in both instances, and much infiltrated with round cells. Angelucci holds that these changes were the primary ones, and describes them as phlebitic. In support of this statement he mentions that in one of these patients he was able, after death, to examine the unaffected eye—which up to the last had been perfectly healthy—when he found that, while the central vein was unobstructed, its walls were thickened and infiltrated with round cells just as in the occluded vein of the other globe.

Before accepting Angelucci's theory of the phlebitic nature of the thrombus, we must first satisfy ourselves as to the evidence supporting it. Weinbaum is strongly antagonistic

to the adoption of any such view, and considers that all definite signs of inflammation are lacking. The changes in the vein wall might, he thinks, be much more probably due to œdema and other effects of the lowered blood pressure and retarded peripheral circulation than to any inflammatory process. That the circulation must have been much slower than normal and the blood pressure greatly decreased is evident, he thinks, from the entire absence of retinal hæmorrhage in any of Angelucci's cases. The uninflamed state of the peripheral vessels elsewhere is also an argument against his contention. That in two cases of severe valvular disease, eventually causing death, there should have been an isolated patch of phlebitis or periphlebitis in the central retinal vein, and no trace of such a condition anywhere else, is, to say the least of it, highly improbable. Moreover, the endothelium of the vein was intact, and this in itself is an argument against the inflammatory origin of the thrombosis.

Schnabel has also described a case, occurring in an eye enucleated for acute secondary glaucoma, where the central retinal vein was blocked and at the seat of the obstruction surrounded by much cell infiltration.

A long and very minute description of Weinbaum's case follows. We must content ourselves with giving the main facts, referring such as wish for more detailed information to the original.

P. K., æt. 26, admitted 8 Dec., 1891. History good, except that three years before he had an attack of pneumonia. Eyes healthy till September, 1891, and his vision was good, both for near and distant objects. At that time the sight of the right eye began to fail; first, in the nasal half of the field, and then more gradually on the temporal side also. Till a fortnight before admission there had been no pain in the head or eye, and no rainbows had been seen round a light.

Present Condition.—General health, apart from the local affection, thoroughly good.

L. eye shows slight hyperæmia of the palpebral conjunctiva: otherwise normal. T. normal, V. = 1.

R. eye T + 1. Considerable circumcorneal injection;

cornea generally clouded, the opacity looking stippled; anterior chamber shallow, and pupil dilated almost to its maximum. The iris was swelled and very hyperæmic, and on its surface near the margin of the pupil were several streaks of blood. The vitreous was full of floating opacities and the fundus could not be clearly seen. The disc could be made out only as a round red patch; whether excavated or not it was impossible to say. The vessels, as they emerged from the nerve, were just recognisable, and seemed to be almost entirely on the nasal side; numerous streaked retinal hæmorrhages were indistinctly seen. V. = hand movements at $\frac{3}{4}$ m. in outer part of the field. Above and below the field for hand movements was very contracted, and on the nasal side altogether absent.

On December 12—the fourth day after admission—an iridectomy downwards was performed and progress was, for a time, good. The note of the 18th mentions the appearance in the outer and under quadrant of the pupil of a gelatinous-looking mass, about the size of a hemp-seed. In spite of the daily use of eserine the pupil remained widely dilated.

On the 22nd the pupil was still wide, the wound cicatrix deeply injected, and episcleral injection also well marked. The anterior chamber was again shallow, the lower part of the lens slightly opaque, vitreous somewhat clearer than before, and the retinal vessels more distinctly visible. The papilla still much obscured, but it could be definitely made out that there was no excavation. Near the disc were a few retinal hæmorrhages. On the nasal side of the macula there was an area of dark, blackish patches interspersed with bright spots (? choroidal tumour). So far as could be ascertained, the retina was nowhere detached. T. much lower than before the operation; amaurosis.

December 27.—T. again up. The pigmented pupillary edge of the iris unusually broad; vitreous opacities fewer and fundus more distinct. The dark-spotted patch near the macula much as before. In front of the optic disc, leaving only a small part of its nasal side uncovered, is a large, brownish hæmorrhage, from which the nasal veins can be indistinctly followed; the arteries are not recognisable

as such. The anterior surface of this hæmorrhage is raised from the retina, so that it can be best seen with a convex lens (7 D.).

On January 9, 1892, the tension having again risen, the globe was excised. The naked-eye appearance of the section of the nerve was normal.

Microscopic Examination.—The cornea, sclerotic, and choroid hardly changed, the latter in parts being, perhaps, rather thin. The points of entrance of the large vessels and the ciliary nerves, which were seen in great numbers in the sclera and choroid, were carefully observed; in none was there any sign of inflammation.

There is well-marked ectropion of the uveal pigment layer: this is even more extensive above than in the neighbourhood of the artificial coloboma below. The peripheral part of the iris has become closely adherent to the cornea by means of new connective tissue, and is not merely lying against it. The ciliary muscle is unchanged. The pars ciliaris retinæ shows some cystoid degeneration. In the anterior half of the vitreous near the ciliary body are several organised processes of tissue, many round cells, blood, and here and there a few pigment-cells.

There is very distinct excavation of the papilla, this being more marked towards the lower edge of the nerve than in the middle. The nerve-fibre layer, however, is not involved in the cupping, but is very œdematous and much swollen. The papilla, as a whole, therefore, appears thickened. The nerve-fibre layer is at this point split into two equally thick strata, one lying in apposition to the vitreous, the other adhering to the retina. This has been brought about by a diffusion of blood from the large hæmorrhage, previously mentioned, which has insinuated itself like a wedge into the substance of the nerve-fibre layer, and has thus separated it into two. The blood is not equally diffused throughout, but lies in small oval masses, which are distinct from each other. The split in the nerve-fibre layer extends over the whole disc and about 1½ disc diameters in the horizontal meridian to either side.

The membrana limitans interna is much folded on itself, and shows here and there small gaps, from which little

collections of blood project into the vitreous. The nerve-fibre and ganglion-cell layers are much atrophied. On the nasal side, beyond the large hæmorrhage, and on the temporal side, beyond a point four disc diameters from the papilla, no trace of nerve-fibre or ganglion-cell layers can be found. In the immediate neighbourhood of the optic-nerve entrance all the retinal layers are much swelled and œdematous, and, as far back as the inner nuclear layer, infiltrated with blood and pigmented cells. The outer nuclear layer is the only one which in the neighbourhood of the disc approaches its normal structure. The rods and cones are here completely destroyed.

The walls of the retinal blood-vessels show no change.

There is an excess of fibrous tissue in the optic nerve, and a marked atrophy of its fibres, more especially of those in immediate proximity to the central canal.

The central artery of the retina is full of blood.

The central vein, at a point 1¼ mm. behind the lamina cribrosa, is plugged by a thrombus about ¾ mm. long. On the wall of the vein next the artery the endothelium is healthy. Between this and the thrombus is a very narrow fissure containing a few blood-corpuscles, while the thrombus itself springs from the opposite side of the vein-wall. It consists of a fibrous stroma enclosing numerous oval and spindle-shaped cells, which much resemble those found in sarcomatous or new granulation tissue. Two small vessels run along the margin of the thrombus in such a manner as to leave it doubtful whether they are not branches of the vein itself. Both on the cerebral and ocular side of the obstruction the vein is empty, and shows a wide lumen. Only where the nerve and vessels have been divided is a small drop of blood found in the vein. This may probably have been introduced during the process of enucleation. Horizontal sections of the vein-wall above and below the thrombus show it to be infiltrated with colourless blood-cells, while on the nasal and temporal sides this condition is less marked. At a little distance from the thrombus the wall is healthy.

It may be here added that in view of the possible bearing of the patient's general health on the origin of the throm-

bosis a careful examination was again made some six months after he had left the hospital. The result was absolutely negative. The heart-sounds and area of cardiac dulness were normal, there was no trace of his former pneumonia to be found in the lungs, the urine was free from albumin and sugar, and the man's appearance exceedingly robust.

As to the real origin of this thrombus, the author thinks it likely that it does not correspond to an ordinary thrombosis, but has been brought about by a local affection of the vein, essentially foreign in its nature, possibly an early sarcoma. In any case, the structure of the newly-organised tissue within the vein might well suggest such an explanation. His opinion on this point was confirmed by Prof. Orth, to whom he submitted the sections for examination.

Whether the glaucoma was the primary disease, and the thrombosis secondary, or the thrombosis primary, and the glaucoma secondary is a question which the writer does not venture to answer. There are difficulties in accepting either view, and it must remain undecided ; but there can be no reasonable doubt that the two diseases did not exist independently, but have the closest connection with each other.

N. M. ML.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, NOVEMBER 10TH, 1892.

HENRY POWER, F.R.C.S., President, in the Chair.

Conjunctivitis set up by Flies.—Dr. Berry (Edinburgh) read notes of two cases: (1) An old man in whom severe inflammation of the conjunctiva, accompanied by extensive ulceration of the cornea, came on within twenty-four hours of his having been stung in the eye by a fly which had apparently risen from a dunghill. In addition to the local disease there was marked general prostration, and the patient remained in a feeble state of health for months afterwards. The whole course of the case seemed to indicate that the

poison carried by the fly had produced the local inflammation and also some general poisoning. (2) A man, aged 20, in whom acute swelling of the right eyelid and conjunctiva came on two days after a fly had got into his eye. The inflammation soon became unmistakably diphtherial, and led to complete destruction of the cornea and very serious general symptoms. Dr. Berry was not prepared to state positively that the diphtherial poison was introduced by the fly, yet the rapidity with which the symptoms followed the accident he thought was at least suggestive.

Mr. Caiger related a case he had seen at Moorfields Hospital, which was, he thought, in some respects analogous to the cases mentioned by Dr. Berry. It was that of a stableman who was struck in the eye by a worm from the intestines of a horse. When he came to the hospital a few hours later there was very marked chemosis of the conjunctiva, which gradually subsided. Mr. Caiger thought this might have been due to the introduction of some poisonous material contained in the excreta of the horse.

Hyperplastic Subconjunctivitis.—Dr. Berry described a group of cases under the above title. In these cases a hard swelling could be felt occupying the tissues below the conjunctival fold of the lower lid. This was in some instances associated with the irritation and discomfort common to chronic conjunctivitis. Dr. Berry thought, from clinical experience, that the subconjunctival infiltration originated at a time when the conjunctiva was inflamed, and, for some reason, was not altogether absorbed afterwards, although the overlying conjunctiva regained its normal condition. And, moreover, an independent hyperplasia might arise in this more or less organised deposit, causing it to swell to a greater or less extent, and to be accompanied by symptoms of irritation. In pronounced cases, the conjunctivitis was often very slight, although chemosis and swelling of the preauricular gland might be present.

Mr. Lawford thought he recognised the condition described by Dr. Berry as hyperplastic subconjunctivitis. He asked if Dr. Berry had met with it more commonly in old or young patients, or in connection with any dyscrasia,

and would be glad to know what plan of treatment he had found most suitable.

In reply, Dr. Berry said that hyperplastic subconjunctivitis was generally met with in adults ; chronicity was one of its chief characteristics. He had not found treatment of much avail. In one instance in which he had given salicin, thinking the condition might be rheumatic in nature, improvement had ensued.

Intraocular Injection of Antiseptic Solutions.—Dr. Berry gave an account of some facts elicited during experiments on rabbits, undertaken by his assistant, Dr. Chassaud, with the object of ascertaining the effect of different solutions injected into the vitreous. In some cases, before injecting the antiseptic, the vitreous was inoculated with fresh septic pus. The only substance injected after the inoculation which seemed capable of preventing purulent hyalitis was chlorine water. At the same time this injection was much better tolerated by the retina and vitreous than any other strong antiseptic solution. In two cases of purulent hyalitis in men, chlorine water injected into the vitreous led to immediate improvement, and the eyes were saved, although sight had been lost before the treat ment was adopted.

Dr. Hill Griffith (Manchester) suggested that the trichloride of iodine promised to be very suitable for intraocular injection. It was said to be non-irritating and to become decomposed in the tissues into free chlorine and iodine.

Mr. Hartridge thought that cases frequently occurred in which the injection of antiseptic and germicidal solutions into the eye seemed most desirable, and, if it were shown that this treatment could be safely adopted, we might oftentimes save eyes which now had to be removed.

Mr. Doyne referred to one case in which he had injected boric acid solution into the anterior chamber, and in which arrest of suppuration had resulted.

In replying to these remarks Dr. Berry thought it probable that in the use of intra-ocular injections a distinct advance in ocular therapeutics might be made. He pointed

out that injections into the anterior chamber and into the vitreous could scarcely be compared. He had frequently used solutions of perchloride of mercury to wash out the aqueous chamber, but usually with resulting opacity of cornea. This opacity he had noticed to occur less markedly in children than in adults.

Intraocular Absorption of Iodoform.—Dr. Berry recorded a case in which, after extraction of senile cataract, he applied iodoform freely to the wound. On examining the eye next day the anterior chamber was found to be filled to the extent of apparently two-fifths of its capacity with iodoform, and the rest of the aqueous to be turbid. At some parts caked portions of iodoform could be seen plastered as it were upon the iris. The iodoform was gradually absorbed without causing any great irritation. In a fortnight no trace of it could be seen, and the result of the operation was good. Although he had very frequently applied iodoform after removal of cataract, he had never known it penetrate to the anterior chamber; he thought the fact that it could thus undergo absorption one of interest.

Living and Card Specimens.—Mr. Stanford Morton: Cyst of Iris.

Mr. John Griffith: Rupture of Sclera without marked Defect of Sight.

Mr. Hartridge: (1) Multiple Ruptures of Choroid; (2) Case of Aniridia.

Mr. Work Dodd: Case of Aniridia.